GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: 2/23/80

Project Title: Analyses of Samples of Granular Activated Carbon

Project No: A-2587

Project Director: Dr. J.L. Carden, Jr.

U S

Sponsor: Environmental Protection Agency; Cincinnati, Ohio 45268

Agreement Period: From 2/8/80 Until 2/28/81

Type Agreement: Purchase Order No. C2471NTET

Amount: $9,883 (fixed price)

Reports Required: None specified

Sponsor Contact Person (s):

Technical Matters

Dr. O. Thomas Love, Project Manager
Environmental Protection Agency
26 West St. Clair Street
Cincinnati, Ohio 45219
(513) 684-7281

Contractual Matters
(thru OCA)

Ms. Marelyn E. Parker
Environmental Protection Agency
Contracts Management Division
Cincinnati, Ohio 45268
(513) 684-7745

Defense Priority Rating: none EMSL
~~EMSL~~/CEB

Assigned to: _____ (School/Laboratory)

COPIES TO:

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Division Chief (EES)
School/Laboratory Director
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Project File (OCA)
Project Code (GTRI)
Other _____

2-B53 320

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: 7/23/81

Project Title: Analyses of Samples of Granular Activated Carbon

Project No: A-2587

Project Director: Thomas L. Starr

Sponsor: Environmental Protection Agency

Effective Termination Date: 6/30/81

Clearance of Accounting Charges: 6/30/81 (fixed price)

Grant/Contract Closeout Actions Remaining:

- x Final Invoice ~~and Closing Documents~~
- _ Final Fiscal Report
- _ Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
- _ Other _____

Assigned to: EMSL/CEB (~~School~~/Laboratory)

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Other: _____

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
ATLANTA, GEORGIA 30332

July 16, 1981

Dr. O. Thomas Love
Project Manager (C2471NTET-USEPA)
26 West St. Clair Street
Cincinnati, OH 45219

Dear Dr. Love:

We have evaluated the granular activated carbons included in your second shipment (11 samples). Tests performed include:

1. BET nitrogen surface area
2. Pore size distribution
3. Iodine number
4. Apparent density
5. Percent moisture

This constitutes the final report for this project. If you have any questions concerning these results, please do not hesitate to call.

Sincerely,

Thomas L. Starr
Energy and Materials Sciences Laboratory

TLS/cmh

Enclosure

ANALYSIS REPORT: EPA(C2471NTET) GIT A-2587

ANALYSIS OF SECOND SET OF SAMPLES AS SPECIFIED IN RFP NO. 80-103

Sample ID	Moisture % (wet basis)	Apparent Density (dry basis) gm/ml	Apparent Density (dry basis) lb/ft^3	BET surface area m^2/gm	Iodine No. (dry basis) mg/g
2-A	1.65	.410	25.6	600	607
2-B	24.56	.663	41.4	727	841
2-C	31.63	.713	44.5	759	877
2-D	20.71	.635	39.6	560	721
2-E	0.37	.535	33.4	626	768
2-F	19.77	.580	36.2	761	899
2-G	1.71	.540	33.7	645	767
2-H	1.78	.410	25.6	586	604
2-I	0.66	.490	30.6	1017	1144
2-J	18.95	.628	39.2	591	675
2-K	19.36	.600	37.5	682	823

ADSORPTION ISOTHERM

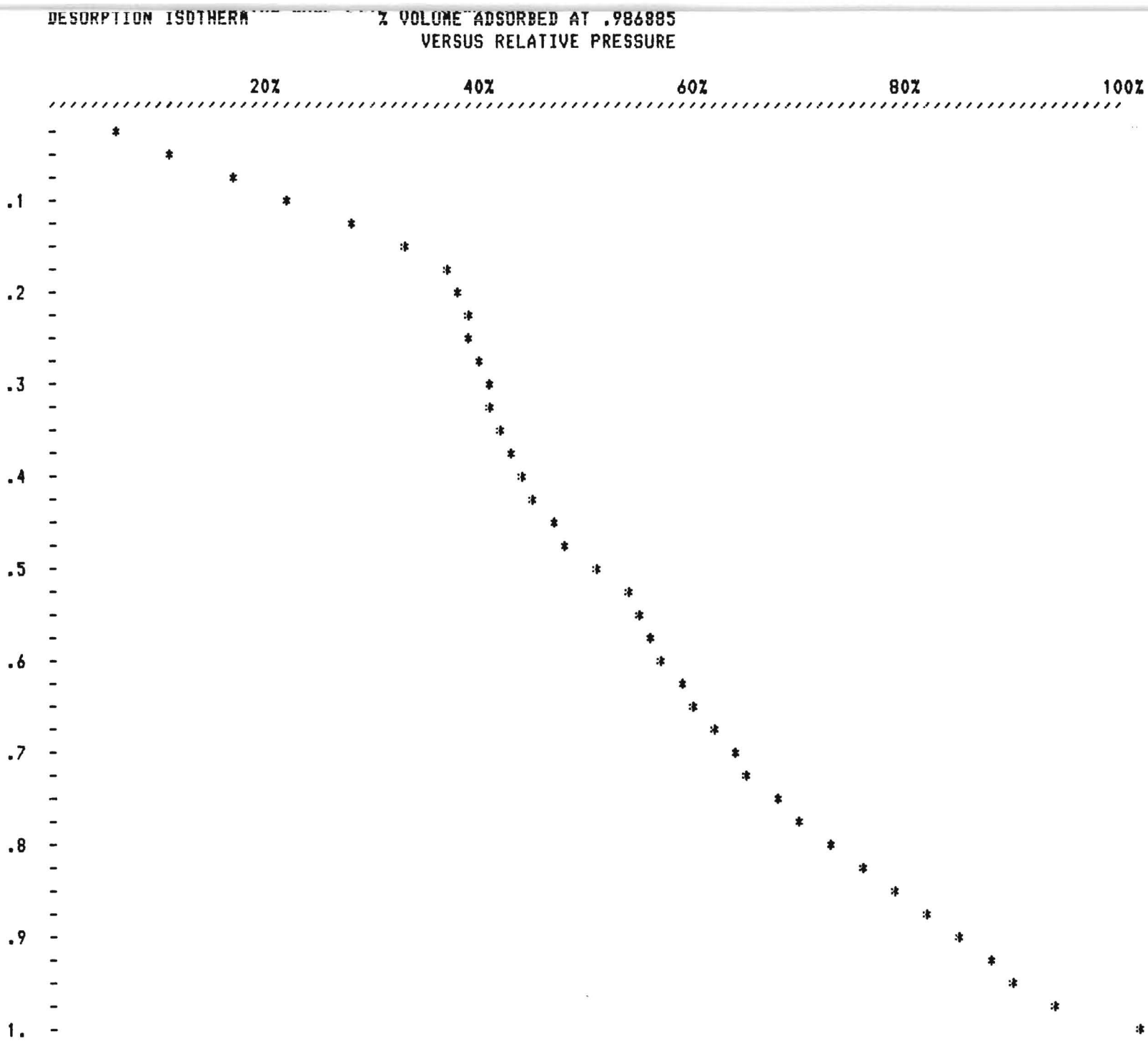
P/PO	VOL ADSORBED
8.51091E-2	152.82
.114813	158.298
.141296	162.677
.169131	166.859

BET AREA= 599.706 SQ M/G

SLOPE= 7.27130E-3
INTERCEPT=-1.28404E-5
STAND. ERROR= 2.85831E-6

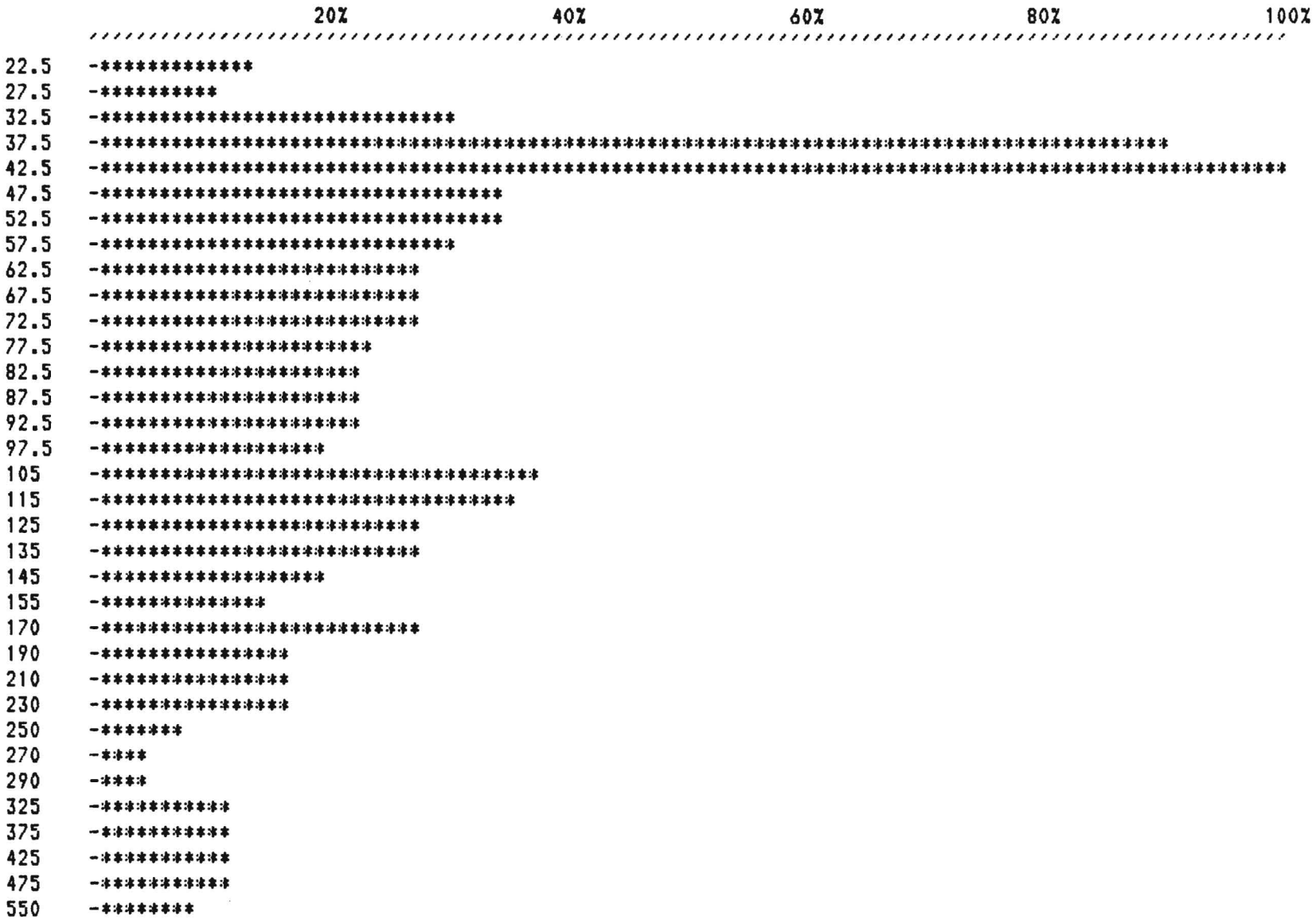
DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.986885	451.961
.985574	433.592
.96	410.707
.915934	392.211
.884852	376.332
.854426	361.116
.821902	340.932
.780852	318.421
.719869	293.108
.632131	266.98
.520105	241.855
.471016	216.382
.402885	197.74
.318846	186.383
.247161	177.424
.206177	172.146
.165561	166.591


DESORPTION ISOTHERM % VOLUME ADSORBED AT .986885
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.

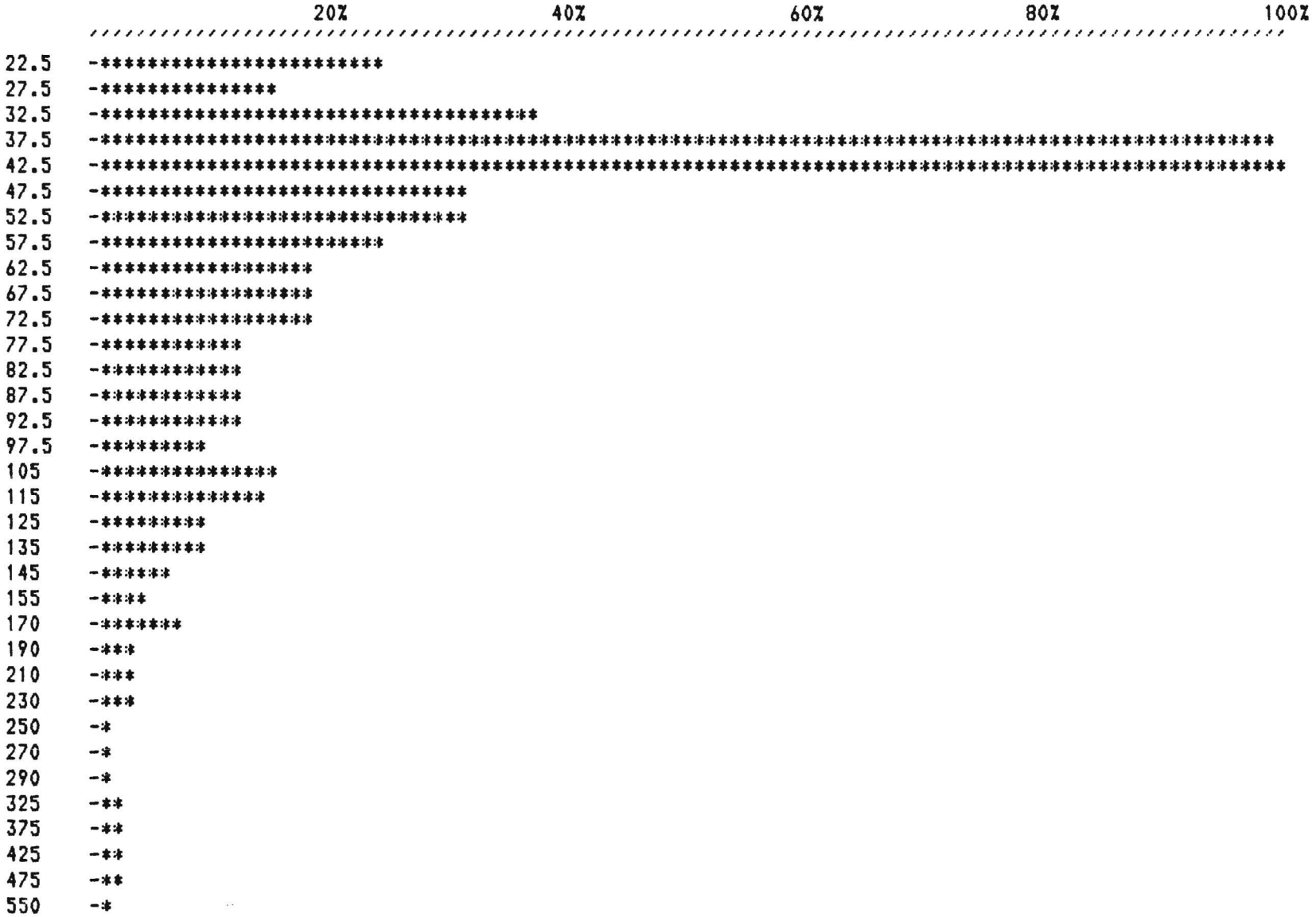
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(6.25151E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(63.9332 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

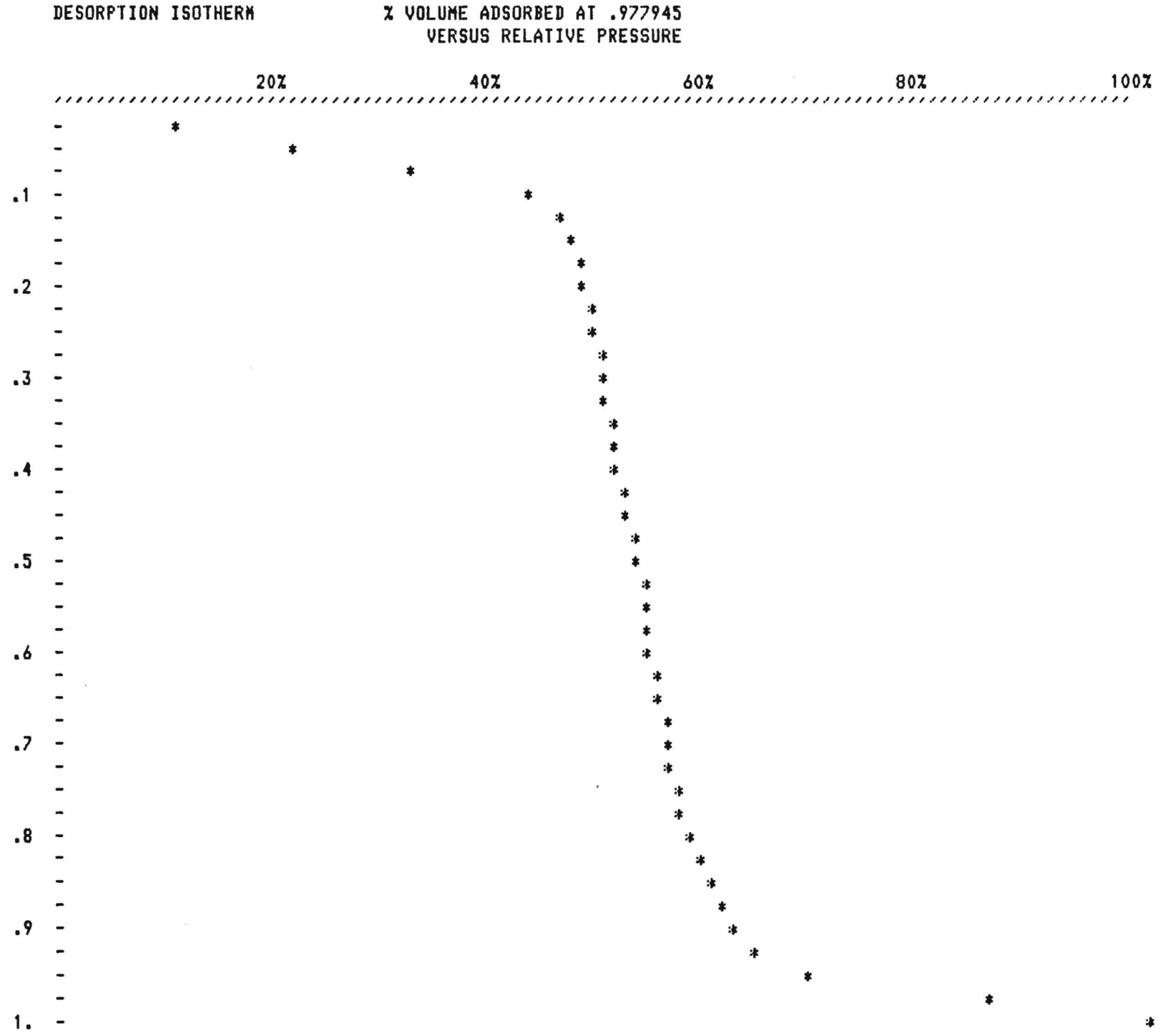
P/PO	VOL ADSORBED
7.03453E-2	184.842
.1124	195.51
.154091	201.978
.180829	205.558

BET AREA= 726.575 SQ M/G

SLOPE= 6.01072E-3
INTERCEPT=-1.96737E-5
STAND. ERROR= 6.55687E-6

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.977945	411.958
.978852	398.246
.973543	345.838
.963314	307.176
.933017	268.312
.831636	246.608
.763789	238.7
.668235	232.392
.6	228.547
.537592	225.804
.482564	222.968
.436987	218.397
.373543	214.487
.302072	210.584
.243638	206.972
.194618	203.215
.145404	198.543
.105278	191.912

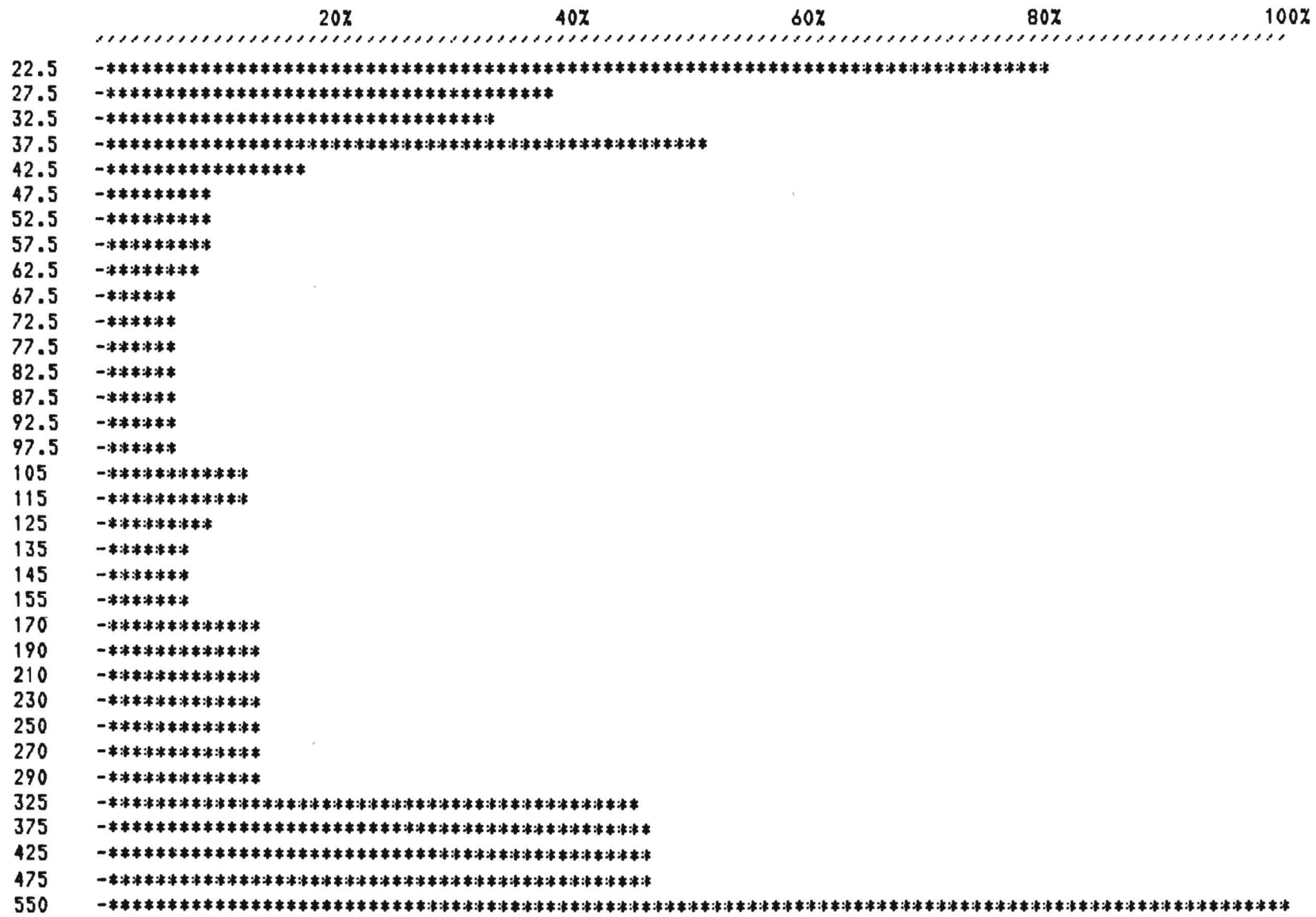

DESORPTION ISOTHERM
% VOLUME ADSORBED AT .977945
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.

DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	.030932	.210991	3.04586	13.2529
500 - 450	475	1.43547E-2	.225346	1.88724	15.1402
450 - 400	425	1.43547E-2	.239701	1.88724	17.0274
400 - 350	375	1.43547E-2	.254055	1.88724	18.9147
350 - 300	325	1.39744E-2	.26803	2.01754	20.9322
300 - 280	290	4.10178E-3	.272132	1.31685	22.2491
280 - 260	270	4.10178E-3	.276233	1.31685	23.5659
260 - 240	250	4.10178E-3	.280335	1.31685	24.8828
240 - 220	230	4.10178E-3	.284437	1.31685	26.1996
220 - 200	210	4.10178E-3	.288539	1.31685	27.5165
200 - 180	190	4.10178E-3	.29264	1.31685	28.8333
180 - 160	170	4.10178E-3	.296742	1.31685	30.1502
160 - 150	155	2.05089E-3	.298793	.658426	30.8086
150 - 140	145	2.05089E-3	.300844	.658426	31.467
140 - 130	135	2.05089E-3	.302895	.658426	32.1255
130 - 120	125	2.85284E-3	.305748	1.14019	33.2656
120 - 110	115	.003738	.309486	1.67194	34.9376
110 - 100	105	.003738	.313224	1.67194	36.6095
100 - 95	97.5	.001869	.315093	.835972	37.4455
95 - 90	92.5	.001869	.316962	.835972	38.2815
90 - 85	87.5	1.86807E-3	.31883	1.14334	39.4248
85 - 80	82.5	1.86798E-3	.320698	1.17421	40.599
80 - 75	77.5	1.86798E-3	.322566	1.17421	41.7732
75 - 70	72.5	1.86798E-3	.324434	1.17421	42.9475
70 - 65	67.5	1.86798E-3	.326302	1.17421	44.1217
65 - 60	62.5	2.59624E-3	.328898	1.91641	46.0381
60 - 55	57.5	2.84811E-3	.331746	2.1731	48.2112
55 - 50	52.5	2.79039E-3	.334536	2.30391	50.5151
50 - 45	47.5	2.73231E-3	.337269	2.43555	52.9506
45 - 40	42.5	5.30331E-3	.342572	5.3543	58.3049
40 - 35	37.5	1.56615E-2	.358234	17.7153	76.0202
35 - 30	32.5	1.02122E-2	.368446	13.5629	89.5832
30 - 25	27.5	1.19051E-2	.380351	18.6564	108.24
25 - 20	22.5	2.47296E-2	.40508	47.4398	155.679

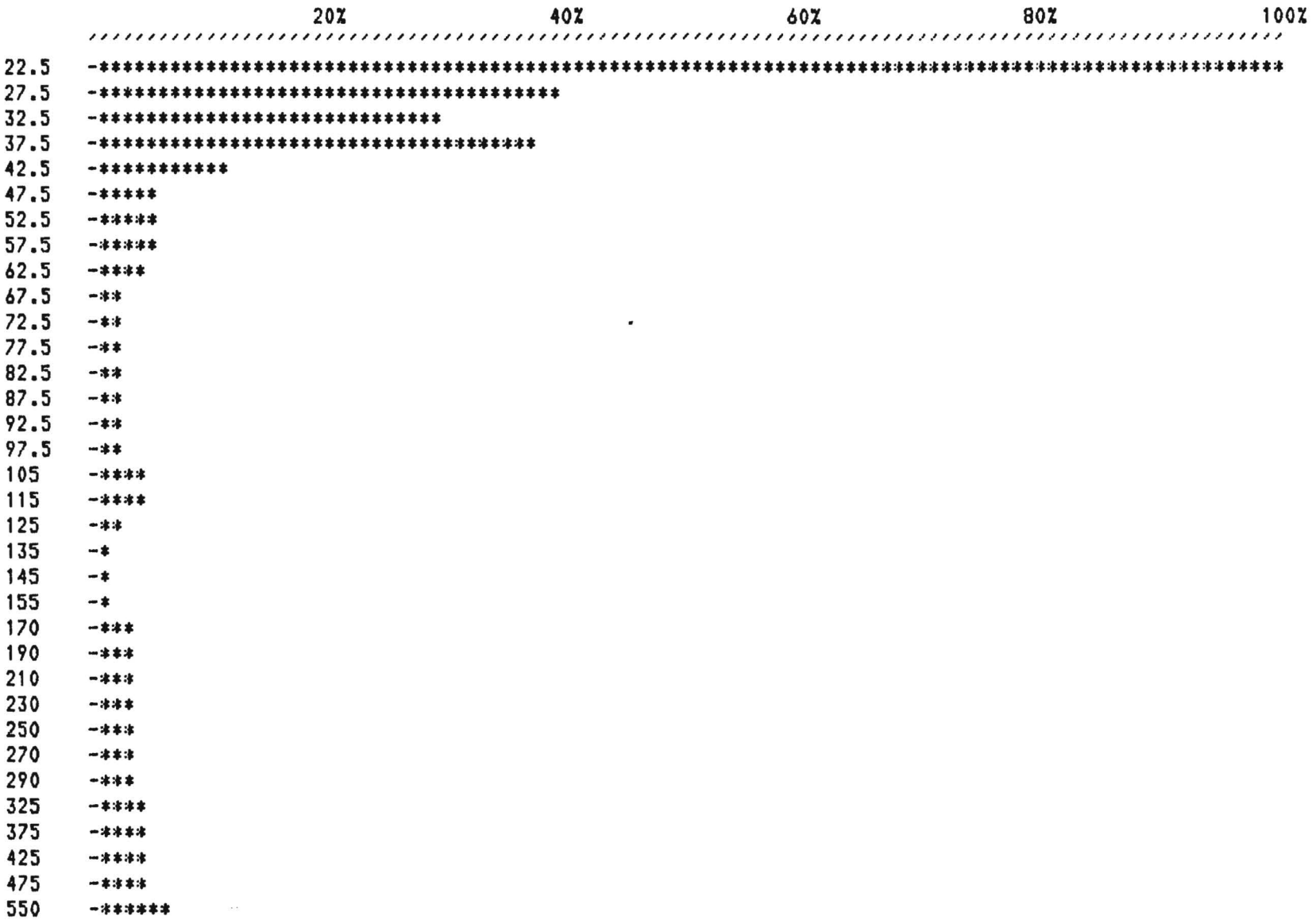
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(.030932 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(47.4398 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHM

P/PO	VOL ADSORBED
6.31782E-2	190.234
.105244	201.419
.132482	206.164
.16649	210.314

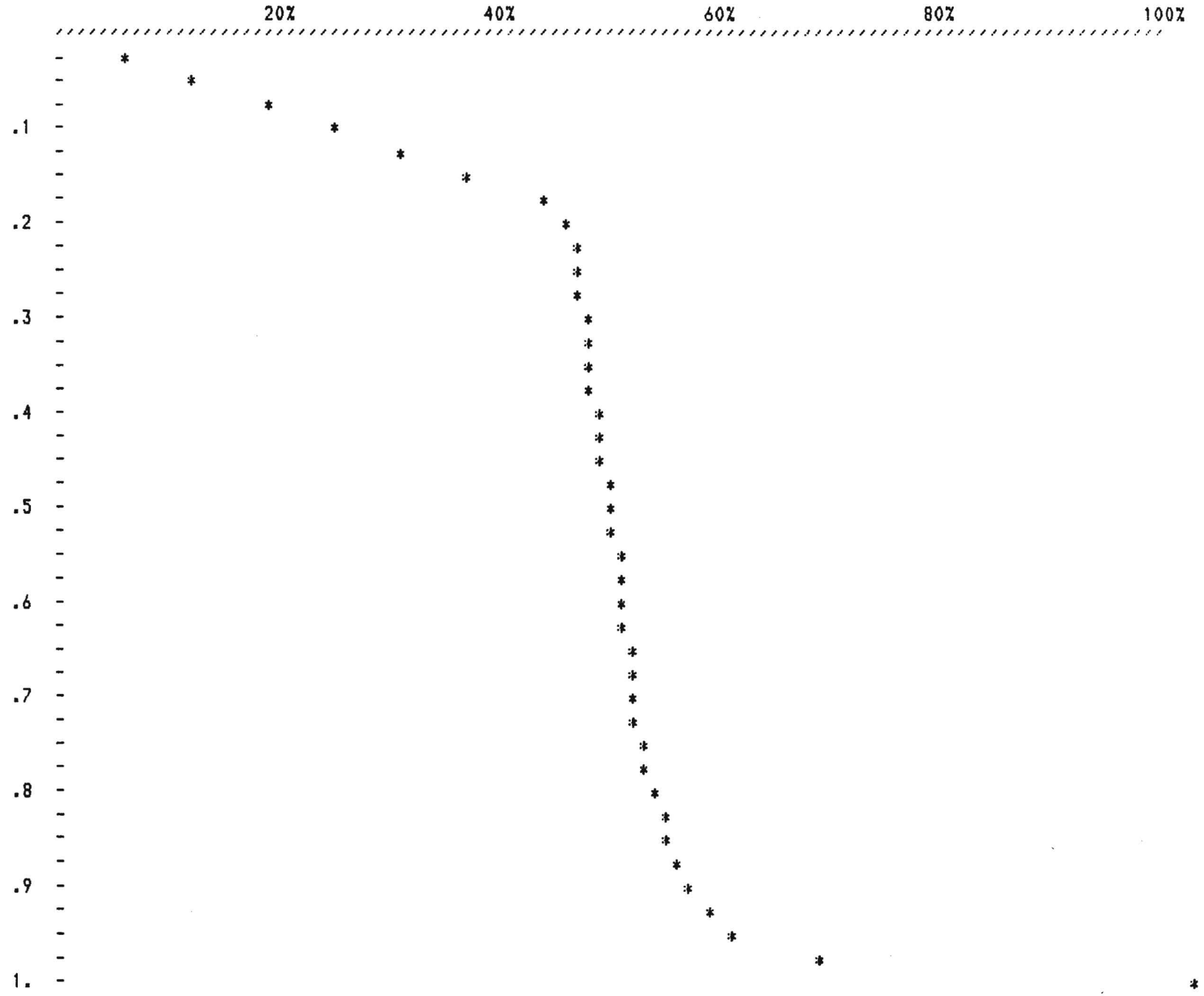
BET AREA= 758.723 SQ M/G

SLOPE= 5.75207E-3
INTERCEPT=-1.48801E-5
STAND. ERROR= 6.48207E-6

P/PO	VOL ADSORBED
.987505	469.435
.986716	458.731
.986585	440.142
.986848	420.835
.98711	401.691
.985402	380.296
.983693	356.163
.978303	332.977
.968181	311.164
.957401	287.074
.911391	271.985
.870902	263.232
.813587	254.327
.734845	246.681
.649397	241.878
.585509	238.939
.523409	236.221
.459179	232.865
.398683	228.377
.331692	224.964
.275008	222.328
.226487	219.387
.185289	216.41

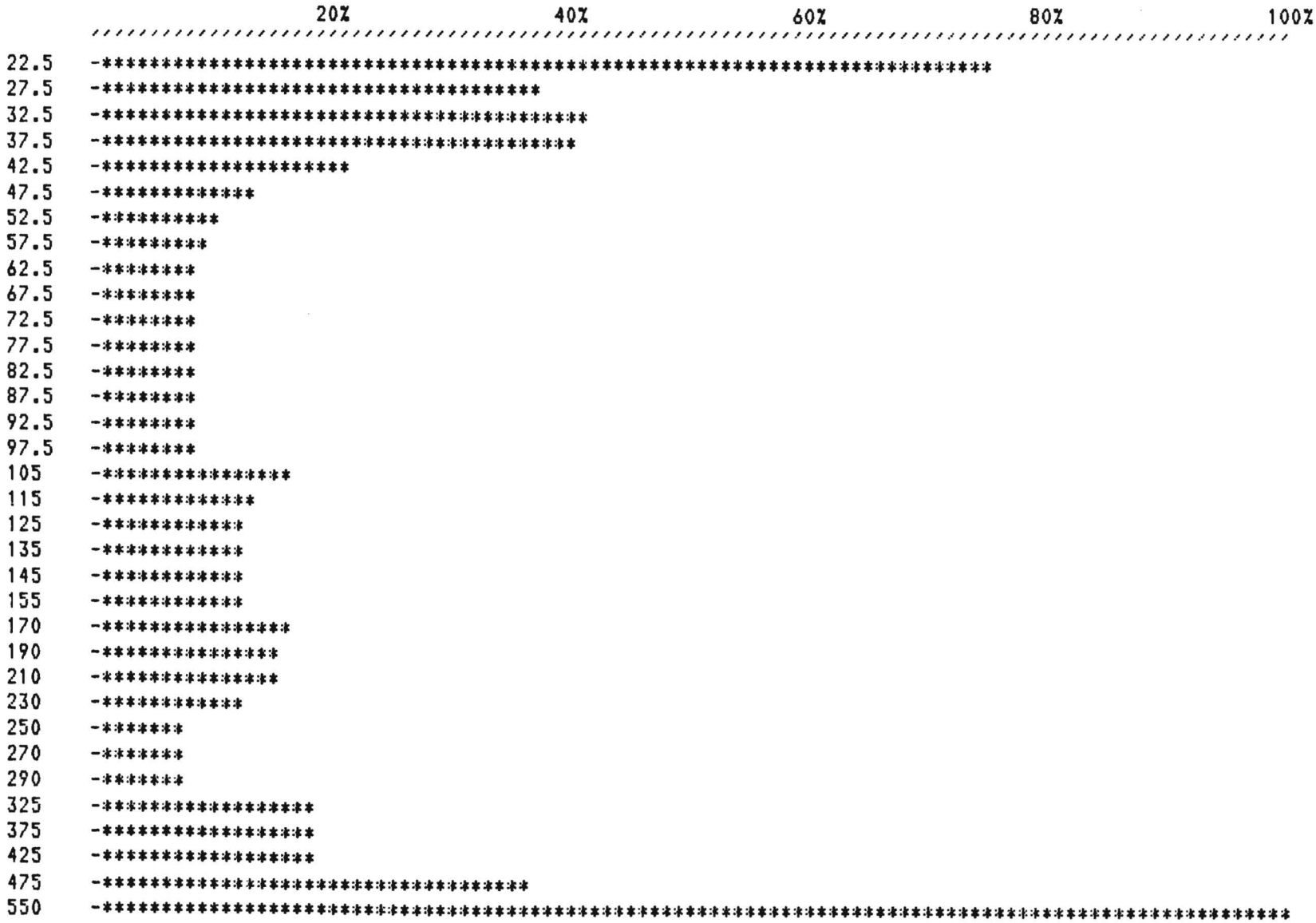
ON ISOTHERM X VOLUME ABSORBED AT .787303

VERSUS RELATIVE PRESSURE

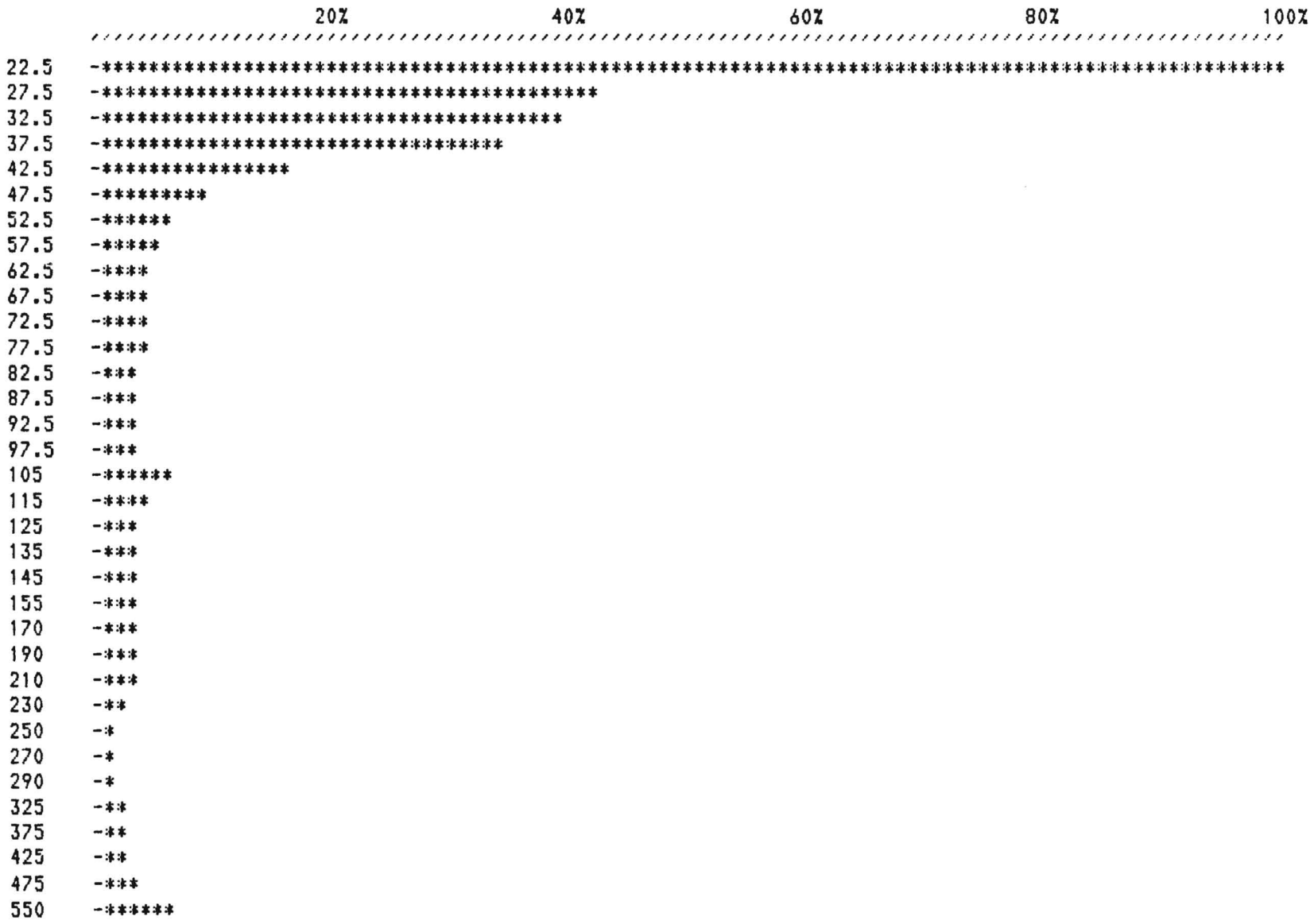


RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	.026773	.319267	2.26864	12.8785
500 - 450	475	9.52888E-3	.328796	1.00102	13.8795
450 - 400	425	4.87444E-3	.333671	.840188	14.7197
400 - 350	375	4.87444E-3	.338545	.840188	15.5599
350 - 300	325	4.87444E-3	.34342	.840188	16.4
300 - 280	290	1.94977E-3	.345369	.336075	16.7361
280 - 260	270	1.94977E-3	.347319	.336075	17.0722
260 - 240	250	1.94977E-3	.349269	.336075	17.4083
240 - 220	230	3.30286E-3	.352572	.763032	18.1713
220 - 200	210	4.13890E-3	.356711	1.02684	19.1981
200 - 180	190	4.13890E-3	.360849	1.02684	20.225
180 - 160	170	4.31851E-3	.365168	1.12215	21.3471
160 - 150	155	3.32019E-3	.368488	1.17716	22.5243
150 - 140	145	3.32019E-3	.371808	1.17716	23.7015
140 - 130	135	3.32019E-3	.375129	1.17716	24.8786
130 - 120	125	3.32019E-3	.378449	1.17716	26.0558
120 - 110	115	3.59753E-3	.382046	1.46104	27.5168
110 - 100	105	4.25552E-3	.386302	2.13457	29.6514
100 - 95	97.5	2.12776E-3	.38843	1.06728	30.7187
95 - 90	92.5	2.12776E-3	.390557	1.06728	31.786
90 - 85	87.5	2.12776E-3	.392685	1.06728	32.8532
85 - 80	82.5	2.12776E-3	.394813	1.06728	33.9205
80 - 75	77.5	2.01527E-3	.396828	1.32991	35.2504
75 - 70	72.5	2.01173E-3	.39884	1.33818	36.5886
70 - 65	67.5	2.01173E-3	.400852	1.33818	37.9268
65 - 60	62.5	2.03282E-3	.402884	1.36565	39.2924
60 - 55	57.5	2.51325E-3	.405398	1.99119	41.2836
55 - 50	52.5	2.62011E-3	.408018	2.12553	43.4092
50 - 45	47.5	3.48061E-3	.411498	3.20734	46.6165
45 - 40	42.5	5.66290E-3	.417161	5.86888	52.4854
40 - 35	37.5	.010749	.42791	12.5264	65.0117
35 - 30	32.5	.010983	.438893	14.2646	79.2764
30 - 25	27.5	9.78877E-3	.448682	15.2948	94.5712
25 - 20	22.5	1.99795E-2	.468661	36.4752	131.046

% OF MAXIMUM PORE VOLUME(.026773 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



% OF MAXIMUM SURFACE AREA(36.4752 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

P/PO	VOL ADSORBED
.118268	161.764
.165272	166.515
.201577	169.612

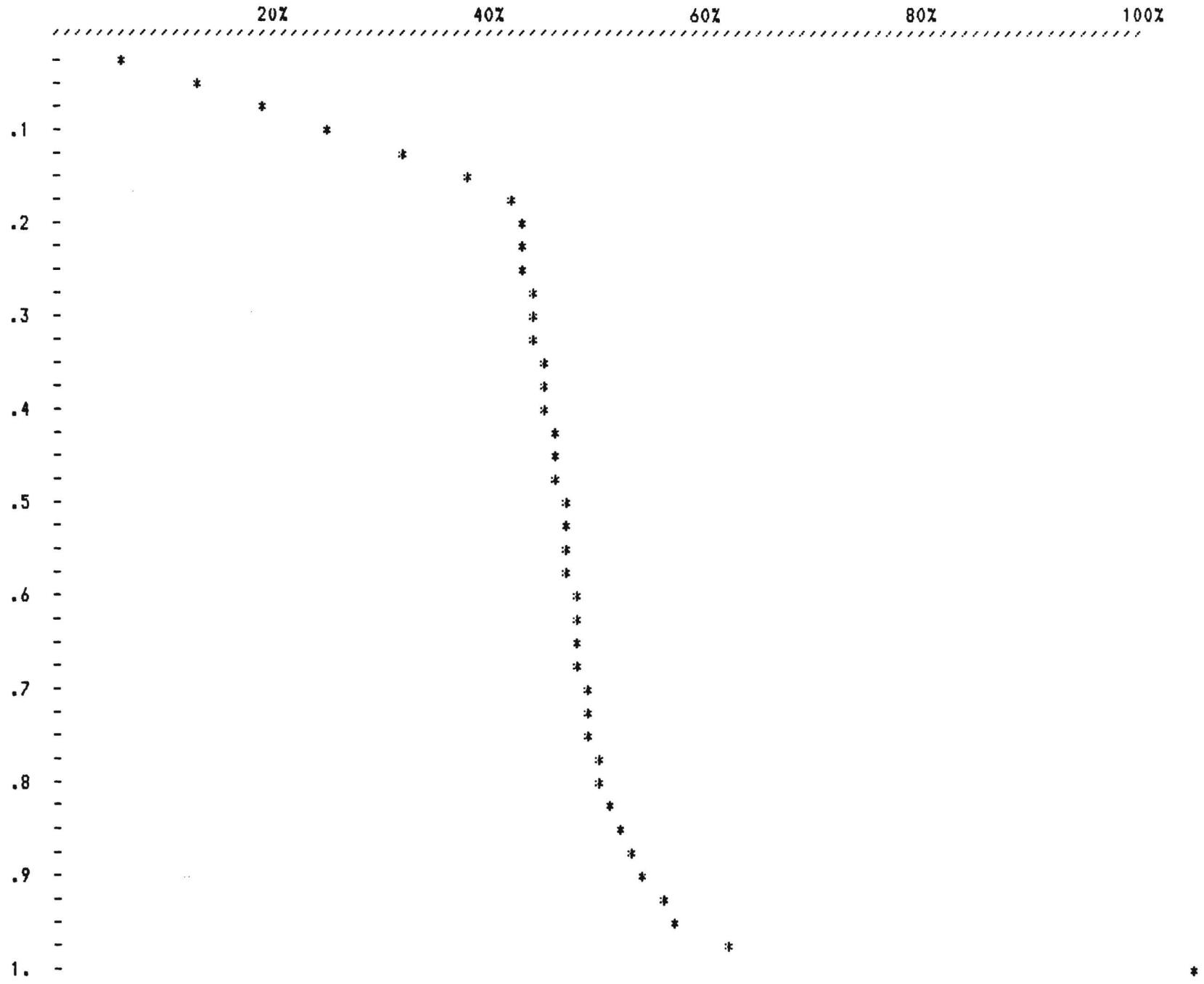
BET AREA= 558.573 SQ M/G

SLOPE= 7.90181E-3
INTERCEPT=-1.08853E-4
STAND. ERROR= 5.70053E-6

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.994695	392.84
.993375	353.388
.990737	318.072
.986779	282.073
.982426	250.086
.950105	225.067
.886386	209.703
.839686	201.879
.79127	196.742
.738633	192.386
.687052	190.49
.637053	188.507
.576369	186.152
.516608	184.054
.464103	180.765
.413445	178.156
.370108	175.982
.311733	173.45
.269847	171.818
.216867	168.985
.166921	165.575

DESORPTION ISOTHERM % VOLUME ADSORBED AT .994695
VERSUS RELATIVE PRESSURE

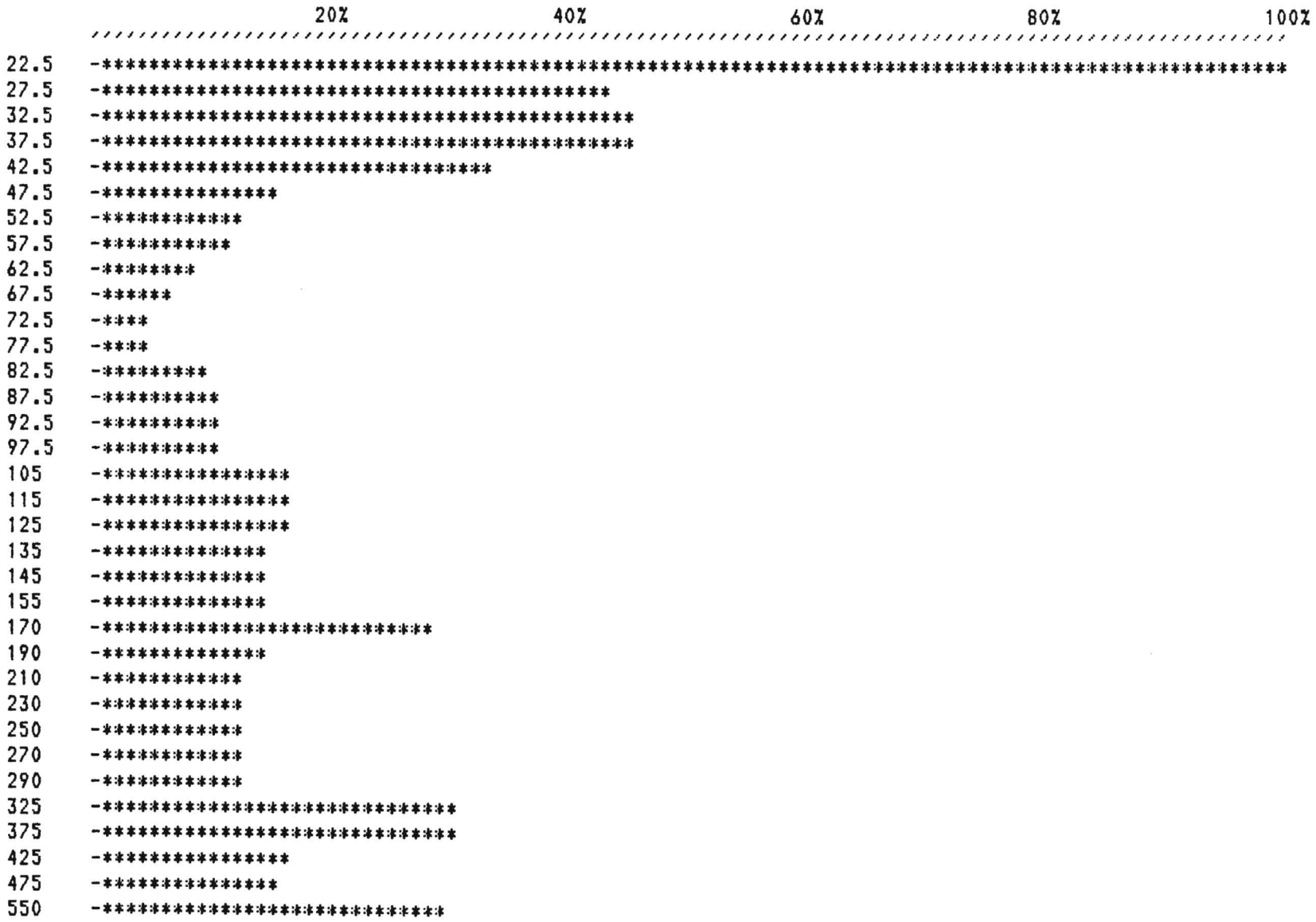


DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	5.76929E-3	.300396	.570049	9.35071
500 - 450	475	2.88465E-3	.303281	.285024	9.63574
450 - 400	425	3.21495E-3	.306496	.394591	10.0303
400 - 350	375	5.97280E-3	.312469	1.3094	11.3397
350 - 300	325	5.97280E-3	.318441	1.3094	12.6491
300 - 280	290	2.38912E-3	.320831	.52376	13.1729
280 - 260	270	2.38912E-3	.32322	.52376	13.6967
260 - 240	250	2.38912E-3	.325609	.52376	14.2204
240 - 220	230	2.38912E-3	.327998	.52376	14.7442
220 - 200	210	2.38912E-3	.330387	.52376	15.2679
200 - 180	190	2.81011E-3	.333197	.680576	15.9485
180 - 160	170	5.51545E-3	.338713	1.6883	17.6368
160 - 150	155	2.75773E-3	.34147	.844148	18.481
150 - 140	145	2.75773E-3	.344228	.844148	19.3251
140 - 130	135	2.78686E-3	.347015	.876584	20.2017
130 - 120	125	3.10347E-3	.350118	1.22906	21.4307
120 - 110	115	3.10347E-3	.353222	1.22906	22.6598
110 - 100	105	3.20545E-3	.356427	1.31409	23.9739
100 - 95	97.5	2.00186E-3	.358429	.98985	24.9637
95 - 90	92.5	2.00186E-3	.360431	.98985	25.9536
90 - 85	87.5	2.00186E-3	.362433	.98985	26.9434
85 - 80	82.5	1.76482E-3	.364198	.888607	27.832
80 - 75	77.5	8.15772E-4	.365013	.483245	28.3153
75 - 70	72.5	8.15772E-4	.365829	.483245	28.7985
70 - 65	67.5	1.24372E-3	.367073	.819577	29.6181
65 - 60	62.5	1.63523E-3	.368708	1.12727	30.7454
60 - 55	57.5	2.12939E-3	.370838	1.65116	32.3965
55 - 50	52.5	2.43258E-3	.37327	1.97258	34.3691
50 - 45	47.5	2.88817E-3	.376158	2.66643	37.0356
45 - 40	42.5	6.61972E-3	.382778	6.81207	43.8476
40 - 35	37.5	8.92703E-3	.391705	10.0136	53.8612
35 - 30	32.5	8.99188E-3	.400697	11.7036	65.5648
30 - 25	27.5	8.52907E-3	.409226	13.2184	78.7832
25 - 20	22.5	1.98156E-2	.429042	37.2753	116.059

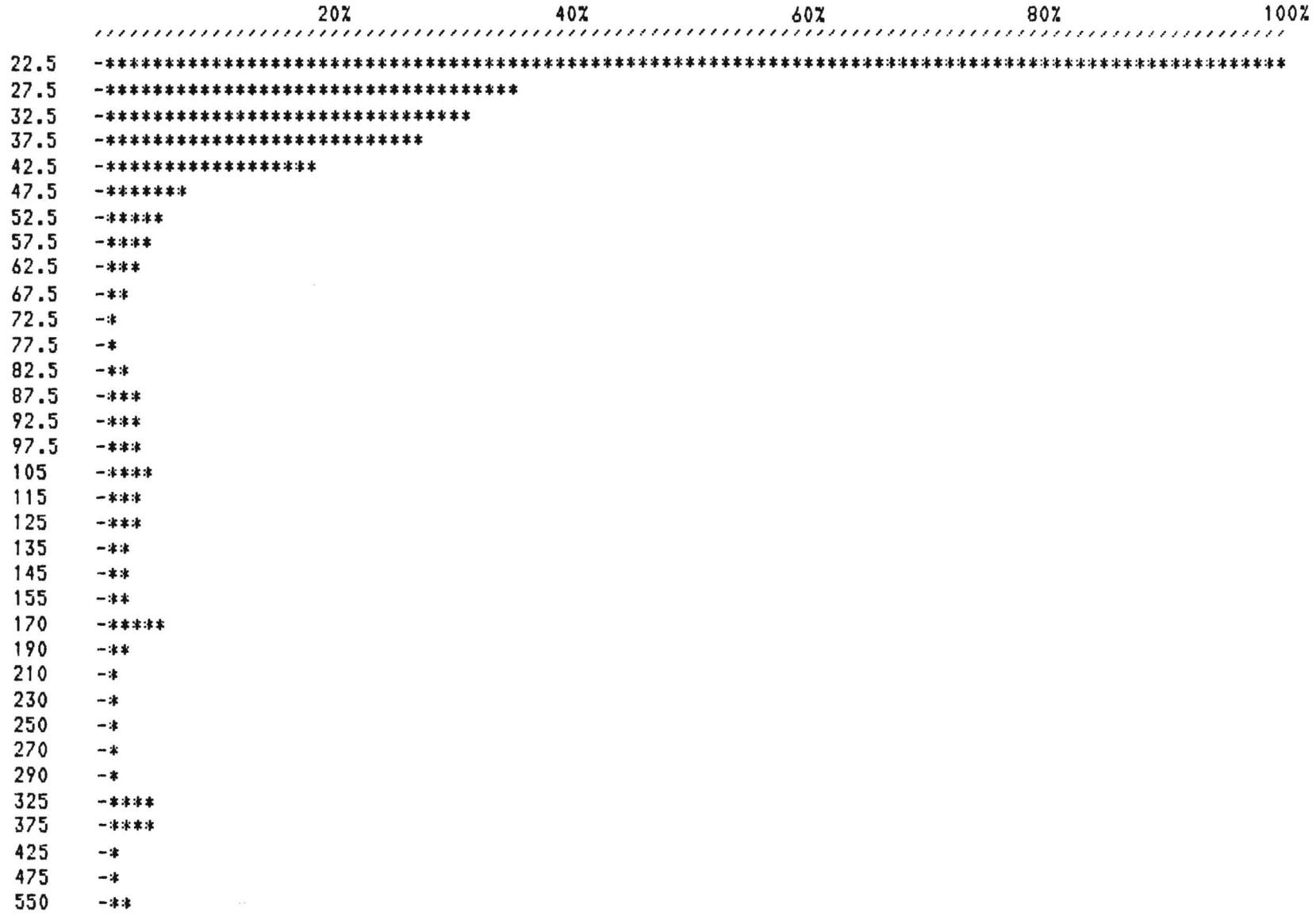
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(1.98156E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(37.2753 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

P/PO	VOL ADSORBED
9.23061E-2	173.85
.146407	181.1
.191987	184.791

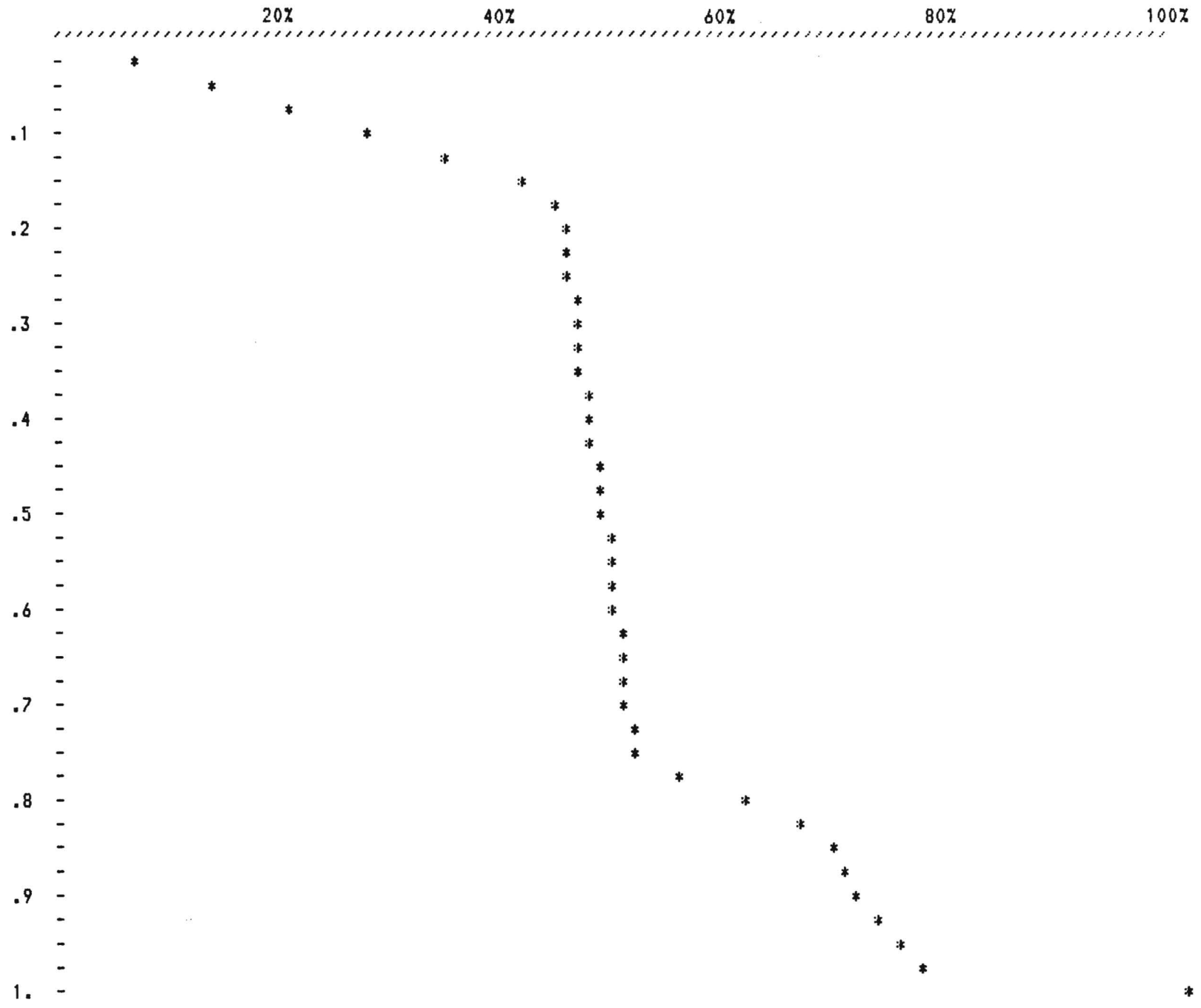
BET AREA= 626.151 SQ M/G

SLOPE= 7.02054E-3
INTERCEPT=-6.86359E-5
STAND. ERROR= 8.58551E-6

DESORPTION ISOTHERM

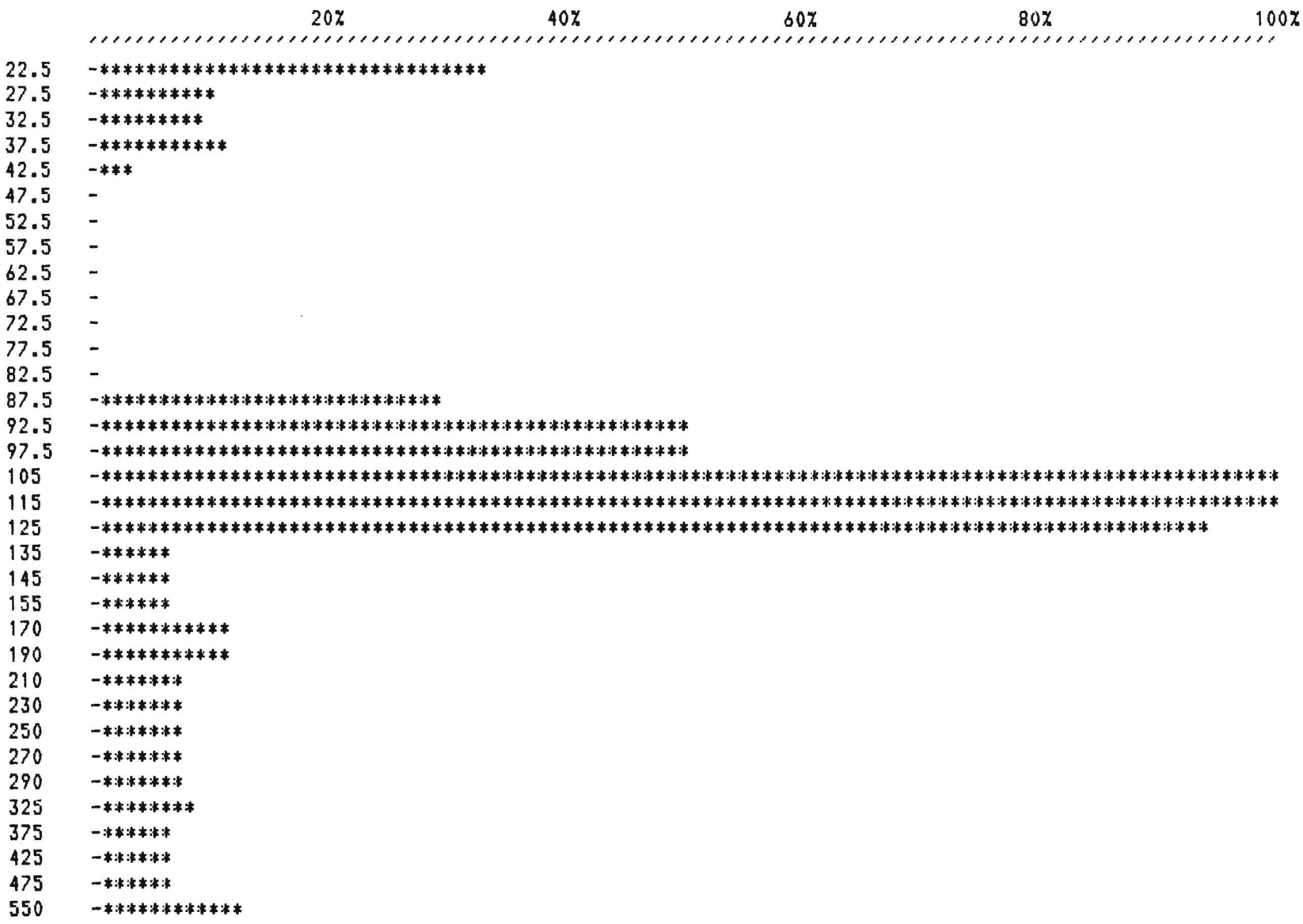
P/PO	VOL ADSORBED
.991396	401.276
.991001	391.455
.988626	377.958
.987439	365.725
.985988	352.687
.981238	335.337
.978072	314.765
.933878	297.578
.894829	288.33
.837839	280.004
.756839	209.49
.660271	204.179
.58402	201.221
.512888	198.729
.450647	195.403
.389316	191.997
.320703	189.294
.262934	186.74
.204717	183.712
.159877	180.589

VERSUS RELATIVE PRESSURE



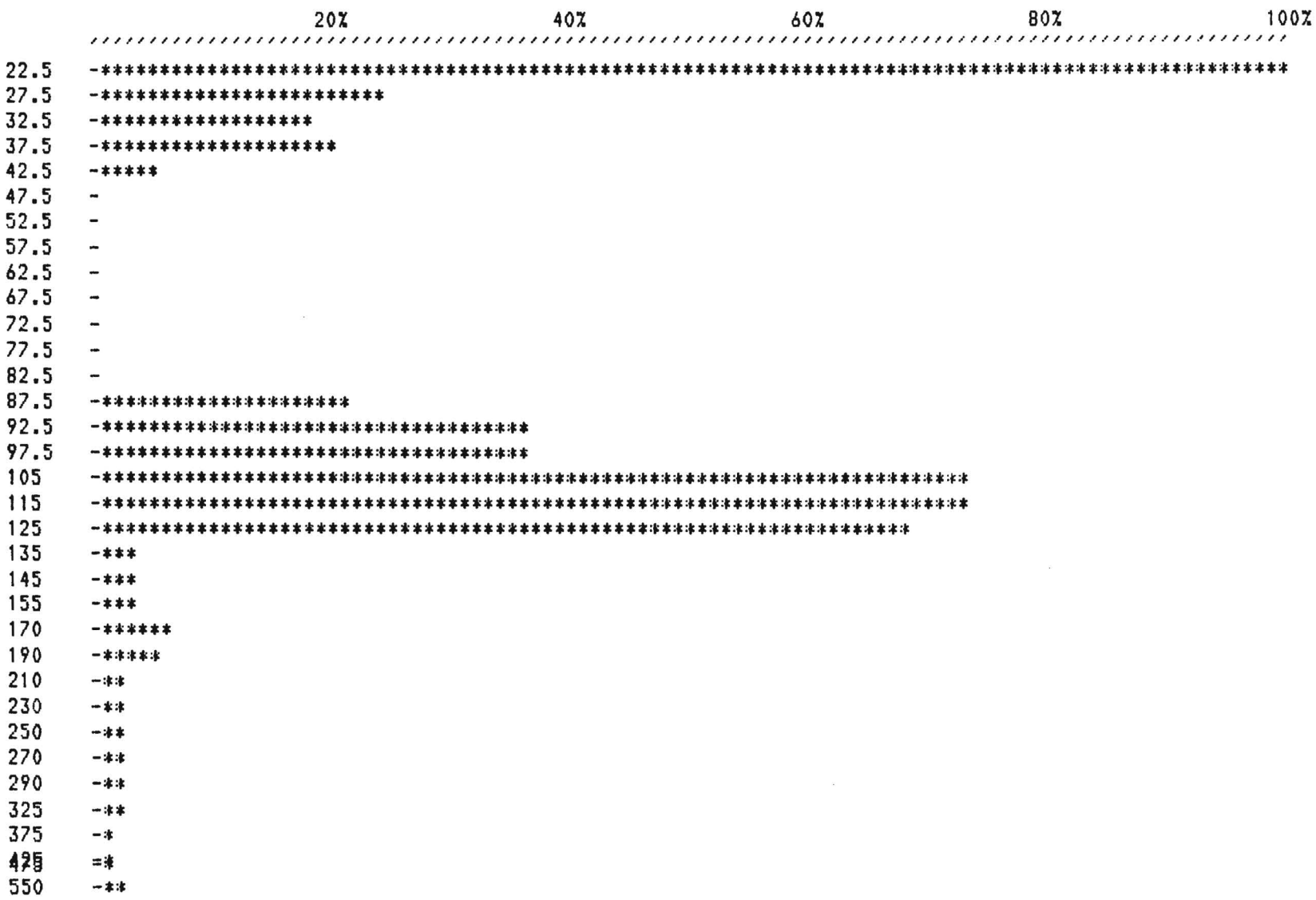
RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	4.83849E-3	.176158	.628197	7.35998
500 - 450	475	2.41924E-3	.178577	.314099	7.67408
450 - 400	425	2.41924E-3	.180996	.314099	7.98818
400 - 350	375	2.41924E-3	.183416	.314099	8.30227
350 - 300	325	3.26012E-3	.186676	.515382	8.81766
300 - 280	290	2.95027E-3	.189626	.600216	9.41787
280 - 260	270	2.95027E-3	.192576	.600216	10.0181
260 - 240	250	2.95027E-3	.195527	.600216	10.6183
240 - 220	230	2.95027E-3	.198477	.600216	11.2185
220 - 200	210	2.95027E-3	.201427	.600216	11.8187
200 - 180	190	4.35825E-3	.205785	1.29998	13.1187
180 - 160	170	4.61982E-3	.210405	1.42998	14.5487
160 - 150	155	2.30991E-3	.212715	.714989	15.2637
150 - 140	145	2.30991E-3	.215025	.714989	15.9787
140 - 130	135	2.30991E-3	.217335	.714989	16.6937
130 - 120	125	.038554	.255889	17.7249	34.4186
120 - 110	115	4.08938E-2	.296783	18.823	53.2416
110 - 100	105	4.08938E-2	.337676	18.823	72.0646
100 - 95	97.5	2.04469E-2	.358123	9.4115	81.4761
95 - 90	92.5	2.04469E-2	.37857	9.4115	90.8876
90 - 85	87.5	1.17943E-2	.390364	5.35167	96.2393
85 - 80	82.5	-1.04239E-3	.389322	-.671324	95.5679
80 - 75	77.5	-1.04239E-3	.38828	-.671324	94.8966
75 - 70	72.5	-1.04239E-3	.387237	-.671324	94.2253
70 - 65	67.5	-1.04239E-3	.386195	-.671324	93.554
65 - 60	62.5	-1.19305E-3	.385002	-.860181	92.6938
60 - 55	57.5	-1.38652E-3	.383615	-1.1027	91.5911
55 - 50	52.5	-1.36605E-3	.382249	-1.09823	90.4929
50 - 45	47.5	-1.10223E-3	.381147	-1.04058	89.4523
45 - 40	42.5	1.20366E-3	.382351	1.38189	90.8342
40 - 35	37.5	4.52521E-3	.386876	5.24178	96.0759
35 - 30	32.5	3.73365E-3	.39061	4.75377	100.83
30 - 25	27.5	3.90410E-3	.394514	6.18863	107.018
25 - 20	22.5	1.35621E-2	.408076	25.896	132.914

% OF MAXIMUM PORE VOLUME(4.08938E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(25.896 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

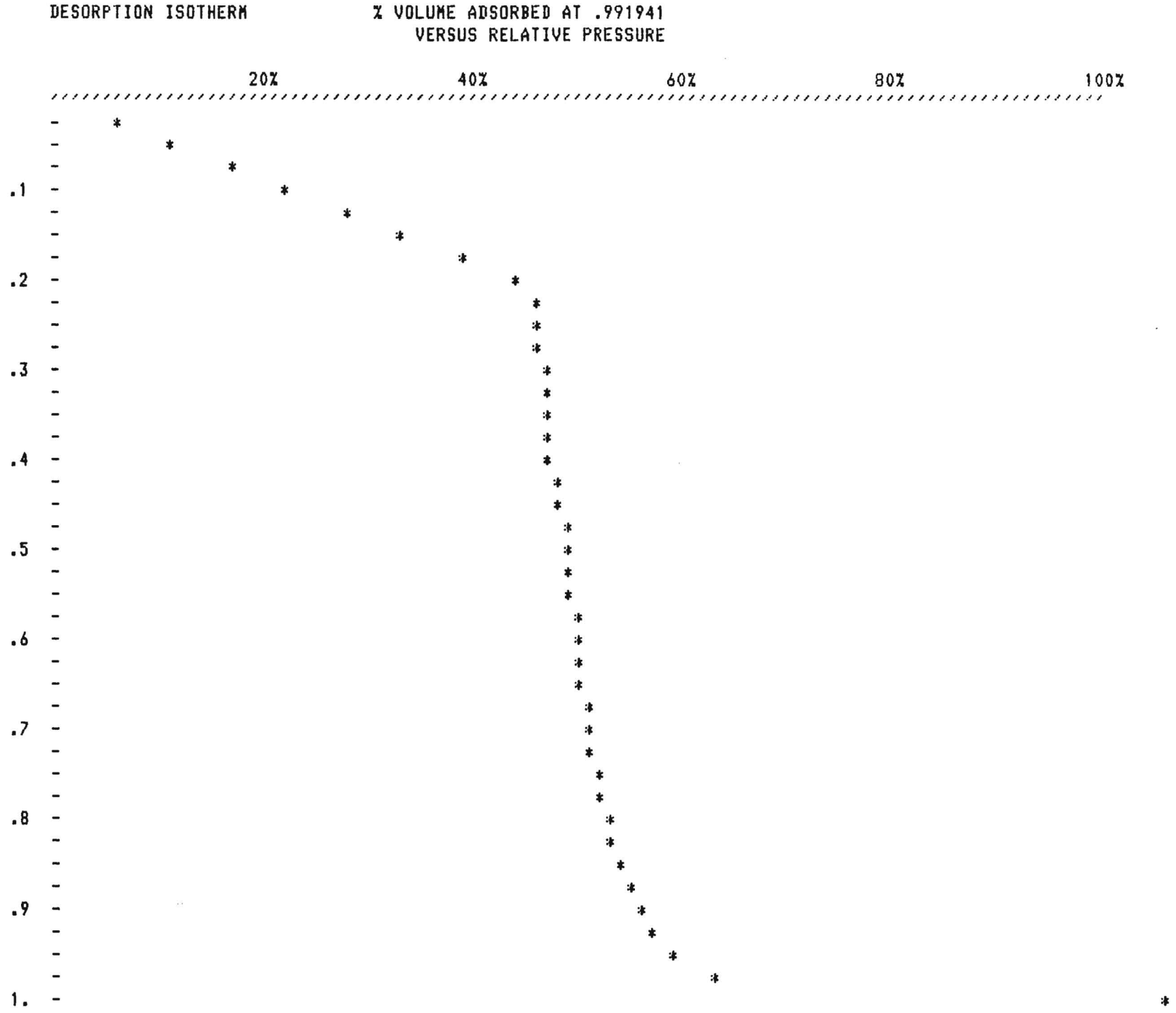
P/PO	VOL ADSORBED
8.92457E-2	203.497
.167976	215.626
.188901	221.031

BET AREA= 761.077 SQ M/G

SLOPE= 5.75080E-3
INTERCEPT=-3.13539E-5
STAND. ERROR= 1.22882E-6

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.991941	495.452
.991414	468.857
.99115	438.622
.989569	406.902
.98364	375.446
.982849	341.2
.975338	314.336
.949776	290.975
.890876	275.975
.818536	262.556
.733151	254.07
.640914	248.724
.564357	245.507
.47921	241.384
.419572	236.042
.357879	233.391
.300455	230.434
.249645	227.503
.206307	225.035


DESORPTION ISOTHERM
% VOLUME ADSORBED AT .991941
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
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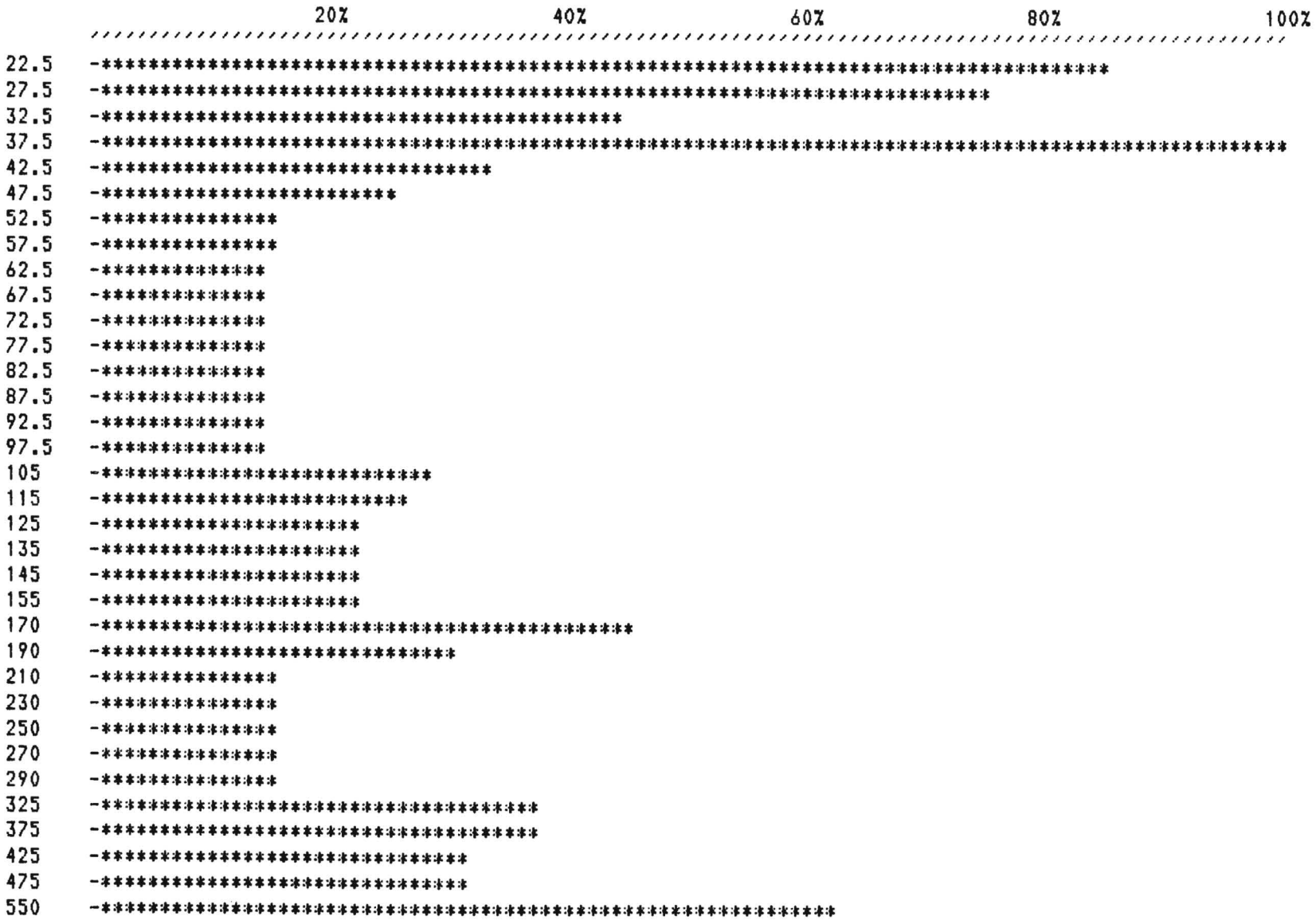
DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	9.45687E-3	.376852	.940394	12.3996
500 - 450	475	4.72844E-3	.38158	.470197	12.8698
450 - 400	425	4.78130E-3	.386362	.5105	13.3803
400 - 350	375	5.68340E-3	.392045	1.19828	14.5786
350 - 300	325	5.68340E-3	.397728	1.19828	15.7769
300 - 280	290	2.27336E-3	.400002	.479314	16.2562
280 - 260	270	2.27336E-3	.402275	.479314	16.7355
260 - 240	250	2.27336E-3	.404549	.479314	17.2148
240 - 220	230	2.27336E-3	.406822	.479314	17.6942
220 - 200	210	2.27336E-3	.409095	.479314	18.1735
200 - 180	190	4.54928E-3	.413645	1.41764	19.5911
180 - 160	170	6.84272E-3	.420487	2.36319	21.9543
160 - 150	155	3.42136E-3	.423909	1.1816	23.1359
150 - 140	145	3.42136E-3	.42733	1.1816	24.3175
140 - 130	135	3.42136E-3	.430751	1.1816	25.4991
130 - 120	125	3.42136E-3	.434173	1.1816	26.6807
120 - 110	115	3.93538E-3	.438108	1.76674	28.4474
110 - 100	105	4.28231E-3	.44239	2.16167	30.6091
100 - 95	97.5	2.14116E-3	.444532	1.08084	31.6899
95 - 90	92.5	2.14116E-3	.446673	1.08084	32.7708
90 - 85	87.5	2.14116E-3	.448814	1.08084	33.8516
85 - 80	82.5	2.14116E-3	.450955	1.08084	34.9324
80 - 75	77.5	2.17786E-3	.453133	1.43499	36.3674
75 - 70	72.5	2.18341E-3	.455316	1.48862	37.8561
70 - 65	67.5	2.18341E-3	.4575	1.48862	39.3447
65 - 60	62.5	2.18341E-3	.459683	1.48862	40.8333
60 - 55	57.5	2.26005E-3	.461943	1.80413	42.6374
55 - 50	52.5	2.28575E-3	.464229	1.9099	44.5473
50 - 45	47.5	3.91068E-3	.46814	3.80848	48.3558
45 - 40	42.5	5.05571E-3	.473195	5.14634	53.5021
40 - 35	37.5	1.53568E-2	.488552	17.6569	71.159
35 - 30	32.5	6.69477E-3	.495247	8.76984	79.9289
30 - 25	27.5	1.15189E-2	.506766	17.8939	97.8227
25 - 20	22.5	.012978	.519744	22.9517	120.774

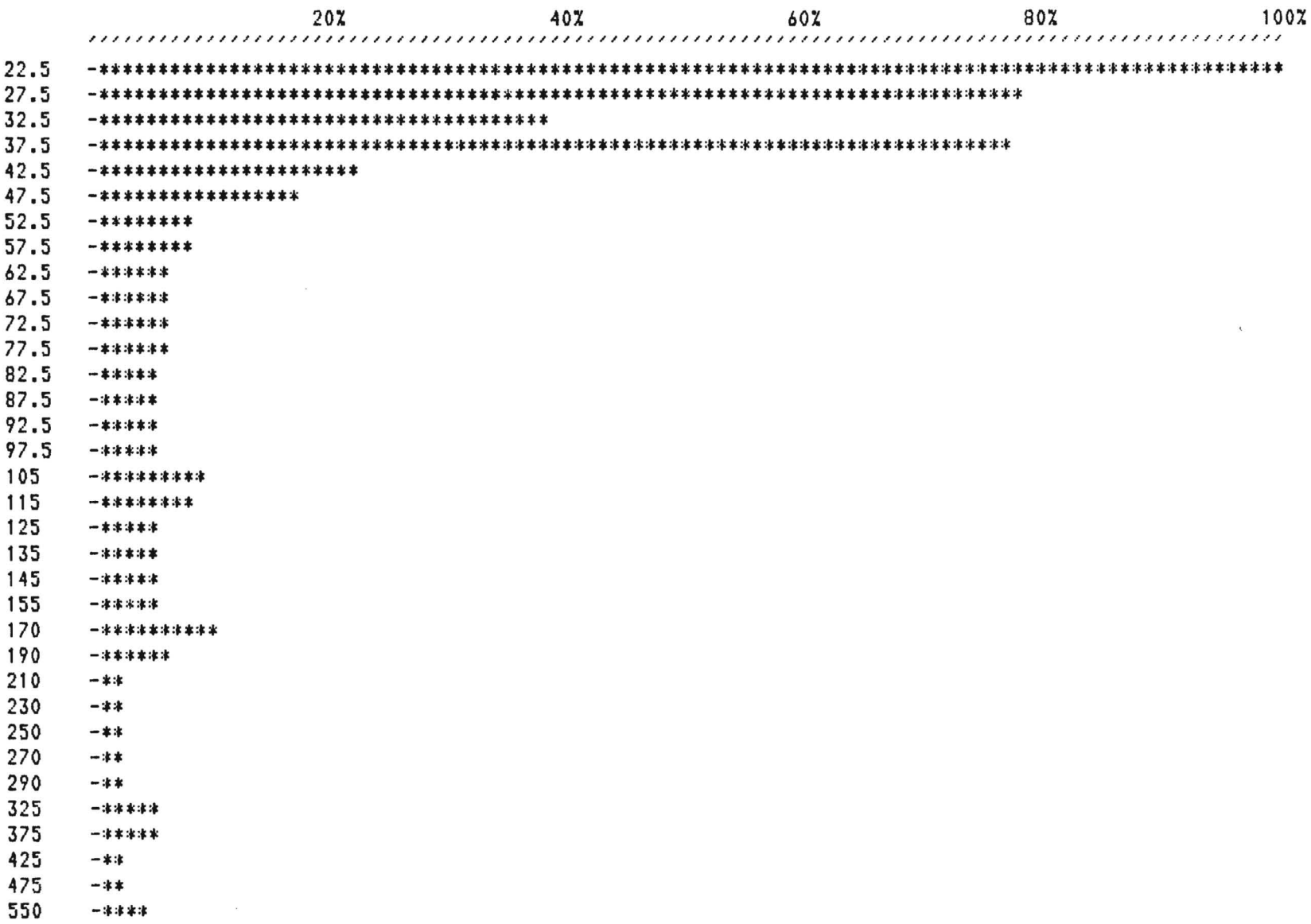
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(1.53568E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(22.9517 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

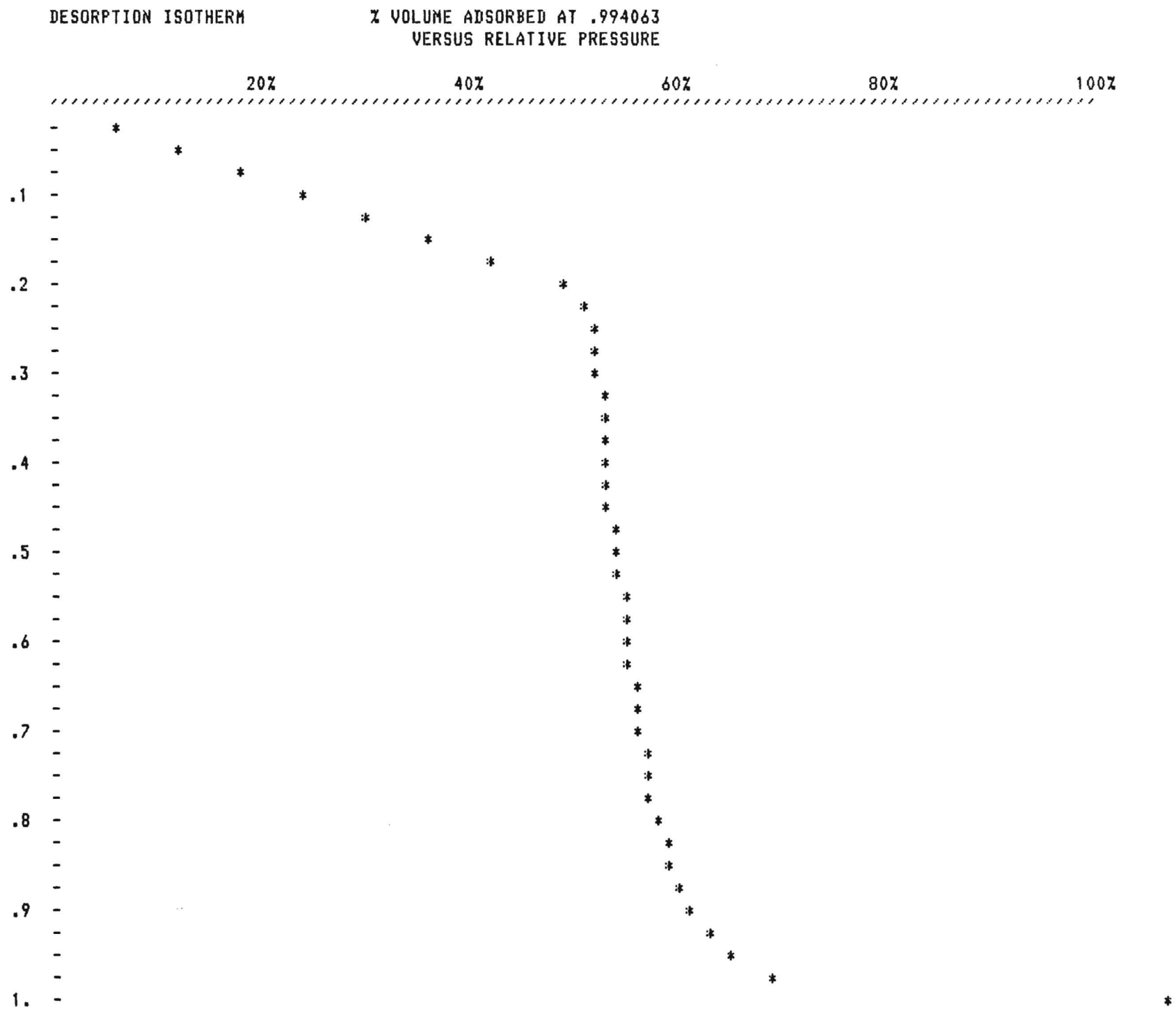
P/PO	VOL ADSORBED
7.26892E-2	177.082
.129769	186.77
.211553	193.652

BET AREA= 644.711 SQ M/G

SLOPE= 6.81699E-3
INTERCEPT=-6.52253E-5
STAND. ERROR= 1.49215E-5

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.994063	380.56
.993142	356.053
.993011	331.267
.992879	306.171
.986693	276.273
.969715	258.905
.940892	241.619
.87864	229.826
.843763	224.624
.796777	220.018
.746897	216.301
.670562	212.454
.592779	209.338
.527631	206.623
.465511	203.173
.388215	203.305
.328556	200.489
.272002	198.198
.210645	194.681


DESORPTION ISOTHERM
% VOLUME ADSORBED AT .994063
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
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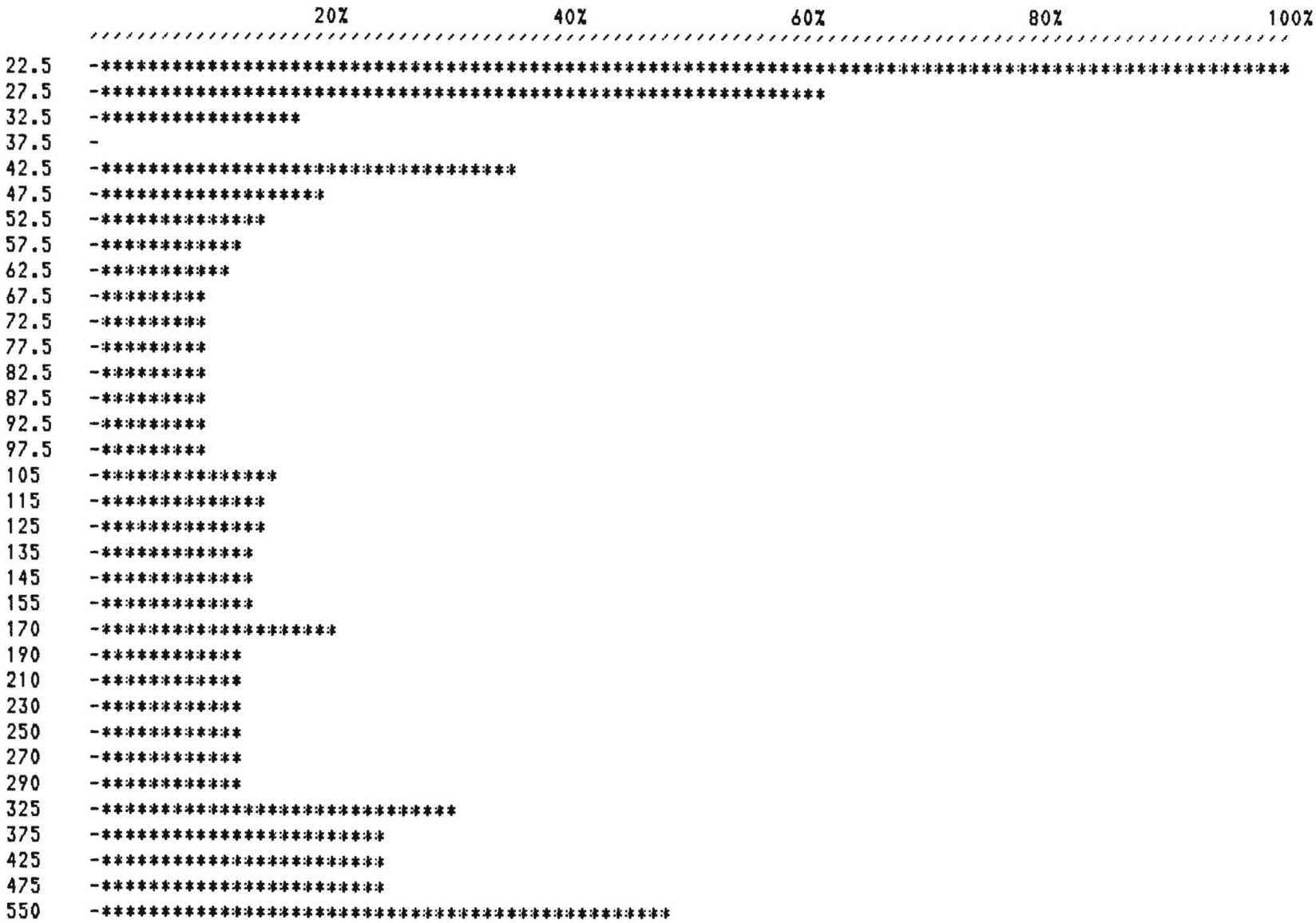
DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	9.51613E-3	.254281	1.10828	7.03626
500 - 450	475	4.75806E-3	.259039	.554138	7.5904
450 - 400	425	4.75806E-3	.263797	.554138	8.14454
400 - 350	375	4.75806E-3	.268555	.554138	8.69868
350 - 300	325	5.87130E-3	.274427	1.30394	10.0026
300 - 280	290	2.41042E-3	.276837	.563267	10.5659
280 - 260	270	2.41042E-3	.279248	.563267	11.1292
260 - 240	250	2.41042E-3	.281658	.563267	11.6924
240 - 220	230	2.41042E-3	.284068	.563267	12.2557
220 - 200	210	2.41042E-3	.286479	.563267	12.819
200 - 180	190	2.41042E-3	.288889	.563267	13.3822
180 - 160	170	3.96081E-3	.29285	1.11517	14.4974
160 - 150	155	2.56593E-3	.295416	.76602	15.2634
150 - 140	145	2.56593E-3	.297982	.76602	16.0294
140 - 130	135	2.65477E-3	.300637	.893416	16.9228
130 - 120	125	2.77950E-3	.303416	1.07228	17.9951
120 - 110	115	2.77950E-3	.306196	1.07228	19.0674
110 - 100	105	3.02644E-3	.309222	1.28942	20.3568
100 - 95	97.5	1.71308E-3	.310935	.820453	21.1773
95 - 90	92.5	1.71308E-3	.312648	.820453	21.9977
90 - 85	87.5	1.71308E-3	.314361	.820453	22.8182
85 - 80	82.5	1.78710E-3	.316148	1.047	23.8652
80 - 75	77.5	1.81514E-3	.317964	1.13284	24.998
75 - 70	72.5	1.81514E-3	.319779	1.13284	26.1309
70 - 65	67.5	1.81514E-3	.321594	1.13284	27.2637
65 - 60	62.5	2.22258E-3	.323816	1.68216	28.9459
60 - 55	57.5	2.30318E-3	.32612	1.79084	30.7367
55 - 50	52.5	2.75550E-3	.328875	2.29741	33.0341
50 - 45	47.5	3.80118E-3	.332676	3.46852	36.5026
45 - 40	42.5	7.01993E-3	.339696	7.24727	43.7499
40 - 35	37.5	-5.05342E-4	.339191	-1.15078	42.5991
35 - 30	32.5	3.32770E-3	.342519	5.04061	47.6397
30 - 25	27.5	.012048	.354567	18.8889	66.5286
25 - 20	22.5	1.97754E-2	.374342	34.9026	101.431

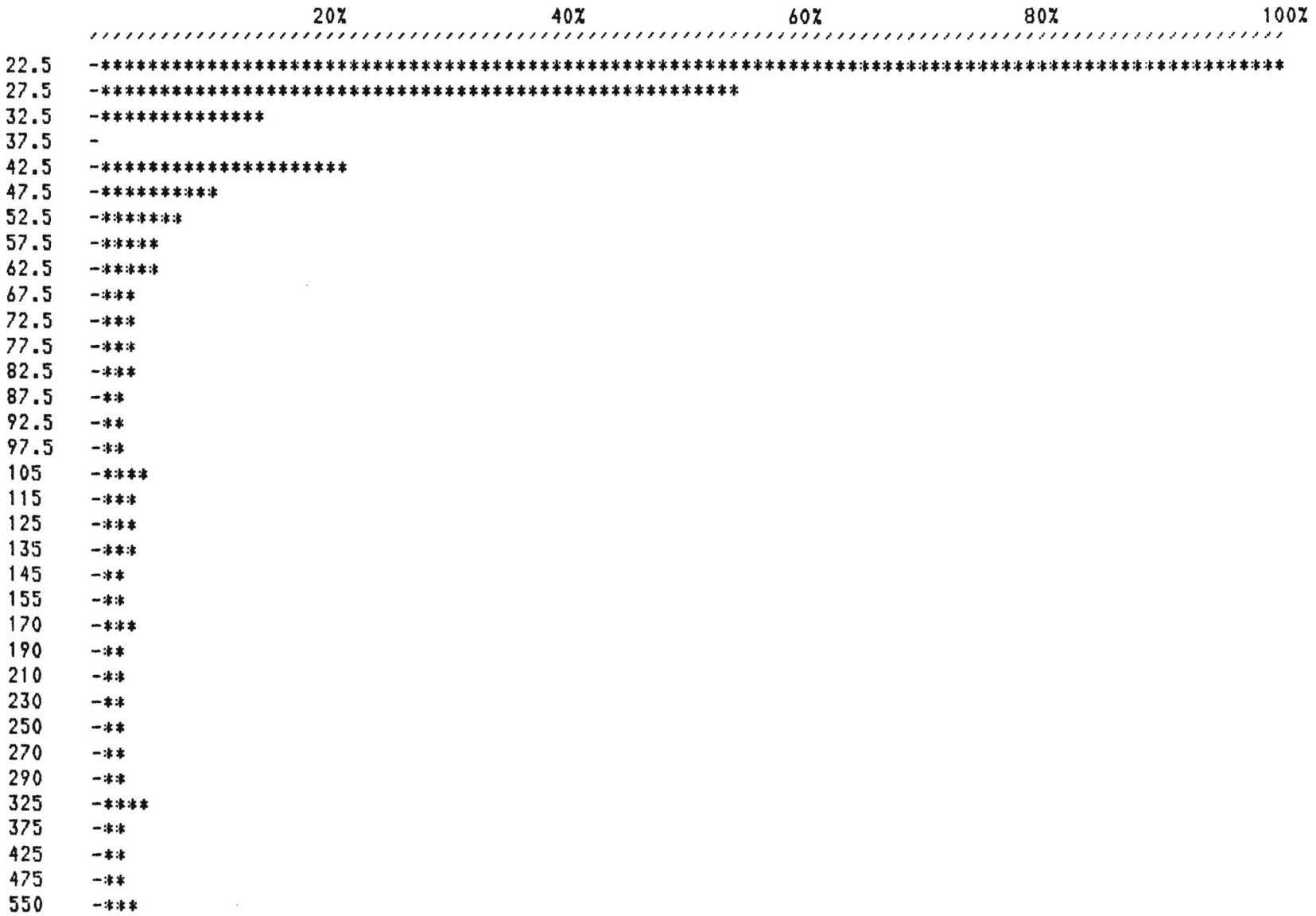
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(1.97754E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(34.9026 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

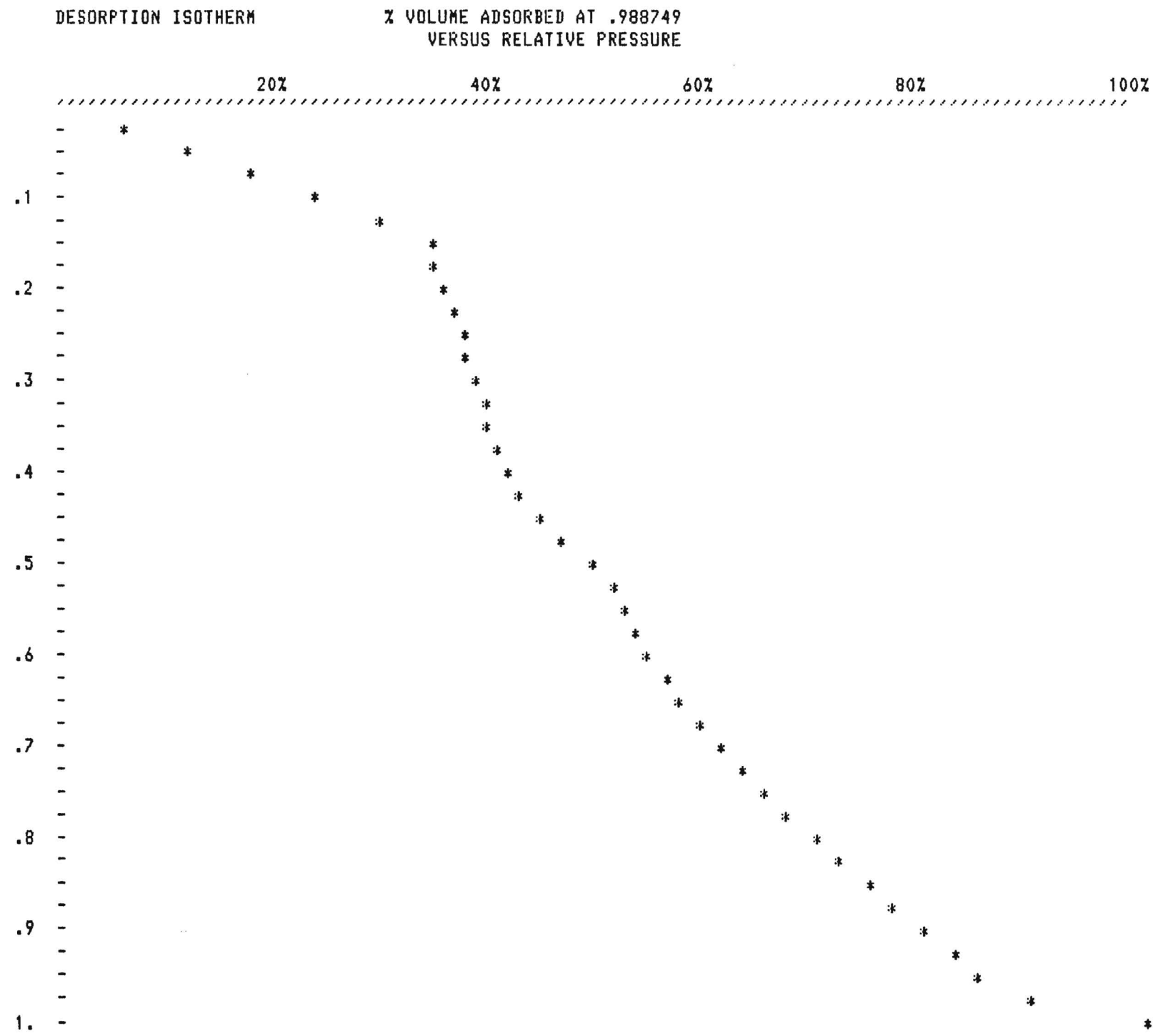
P/PO	VOL ADSORBED
8.22648E-2	148.903
.121734	155.836
.163429	162.093

BET AREA= 586.505 SQ M/G

SLOPE= 7.43336E-3
INTERCEPT=-1.15268E-5
STAND. ERROR= 2.77624E-6

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.988749	459.39
.986784	444.886
.983248	429.024
.971458	410.916
.948927	395.308
.91775	381.139
.888014	366.45
.856052	351.071
.820683	335.78
.787279	317.979
.751125	301.626
.703835	284.167
.6517	268.562
.59642	253.989
.535114	241.104
.487733	226.453
.459229	206.807
.393679	190.452
.298171	178.641
.223399	169.497
.14585	159.193


DESORPTION ISOTHERM
% VOLUME ADSORBED AT .988749
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
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.2
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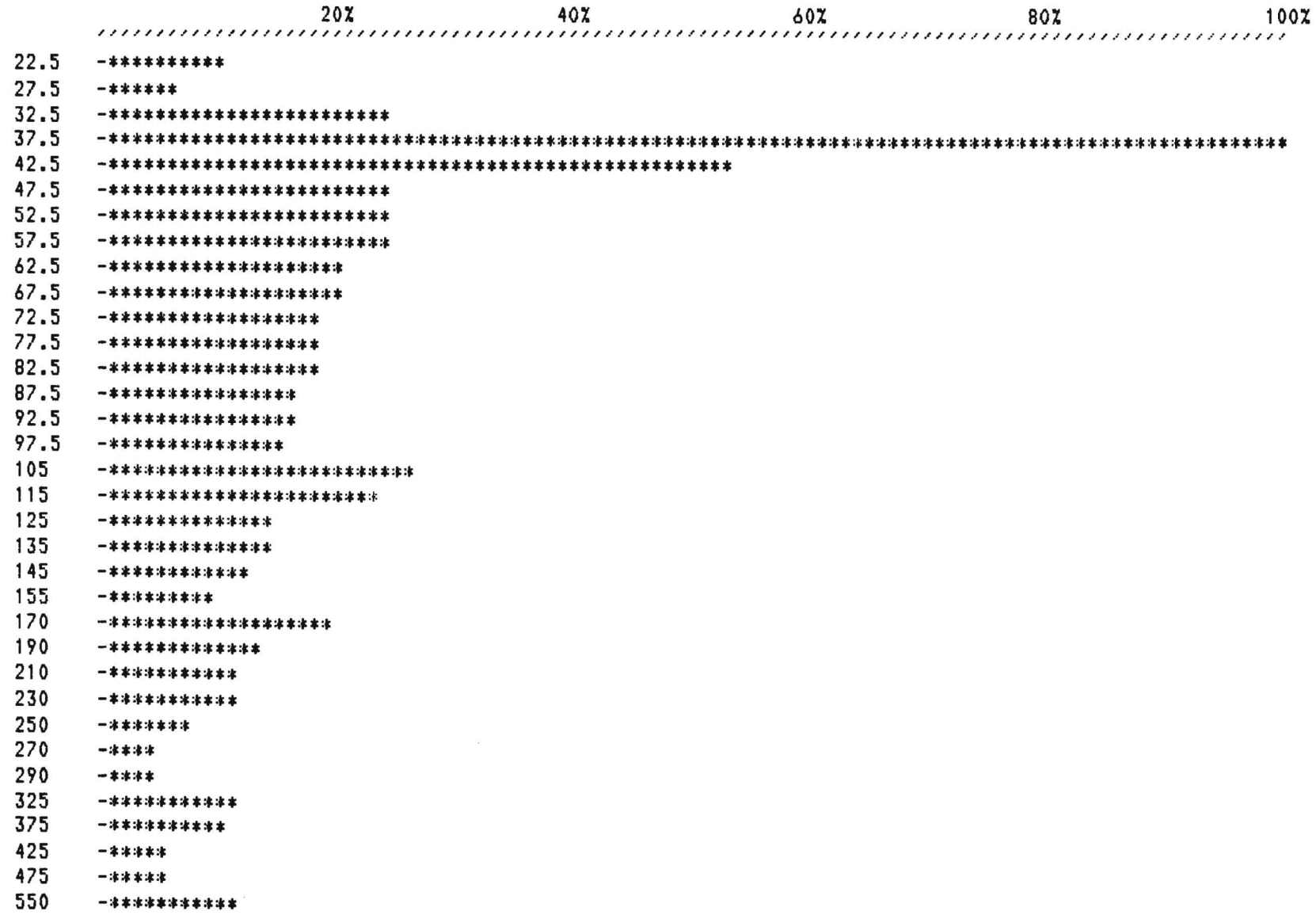
DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	9.03704E-3	.115092	.913384	5.49622
500 - 450	475	4.51852E-3	.119611	.456692	5.95291
450 - 400	425	4.51852E-3	.124129	.456692	6.40961
400 - 350	375	8.50644E-3	.132635	1.34429	7.7539
350 - 300	325	8.82804E-3	.141464	1.41587	9.16977
300 - 280	290	3.53122E-3	.144995	.566349	9.73612
280 - 260	270	3.53122E-3	.148526	.566349	10.3025
260 - 240	250	6.10783E-3	.154634	1.21917	11.5216
240 - 220	230	8.83173E-3	.163466	1.9093	13.4309
220 - 200	210	8.83173E-3	.172297	1.9093	15.3402
200 - 180	190	.010598	.182895	2.53463	17.8749
180 - 160	170	.015544	.198439	4.28568	22.1606
160 - 150	155	7.77201E-3	.206211	2.14284	24.3034
150 - 140	145	9.70177E-3	.215913	3.07028	27.3737
140 - 130	135	1.14374E-2	.22735	3.90441	31.2781
130 - 120	125	1.14374E-2	.238788	3.90441	35.1825
120 - 110	115	1.90333E-2	.257821	7.48911	42.6716
110 - 100	105	.021808	.279629	8.79858	51.4702
100 - 95	97.5	1.25904E-2	.292219	5.82262	57.2928
95 - 90	92.5	1.28784E-2	.305098	6.06573	63.3585
90 - 85	87.5	1.28911E-2	.317989	6.08084	69.4394
85 - 80	82.5	1.46961E-2	.332685	8.23447	77.6738
80 - 75	77.5	1.46961E-2	.347381	8.23447	85.9083
75 - 70	72.5	1.52138E-2	.362595	9.01316	94.9215
70 - 65	67.5	1.64449E-2	.37904	10.8651	105.787
65 - 60	62.5	1.68453E-2	.395885	11.3967	117.183
60 - 55	57.5	1.96763E-2	.415562	15.1548	132.338
55 - 50	52.5	1.97168E-2	.435278	16.1865	148.525
50 - 45	47.5	1.97774E-2	.455056	17.7328	166.257
45 - 40	42.5	4.35706E-2	.498626	43.5474	209.805
40 - 35	37.5	8.25492E-2	.581176	91.0881	300.893
35 - 30	32.5	1.98456E-2	.601021	24.8906	325.784
30 - 25	27.5	5.32401E-3	.606345	8.48708	334.271
25 - 20	22.5	8.40083E-3	.614746	16.4693	350.74

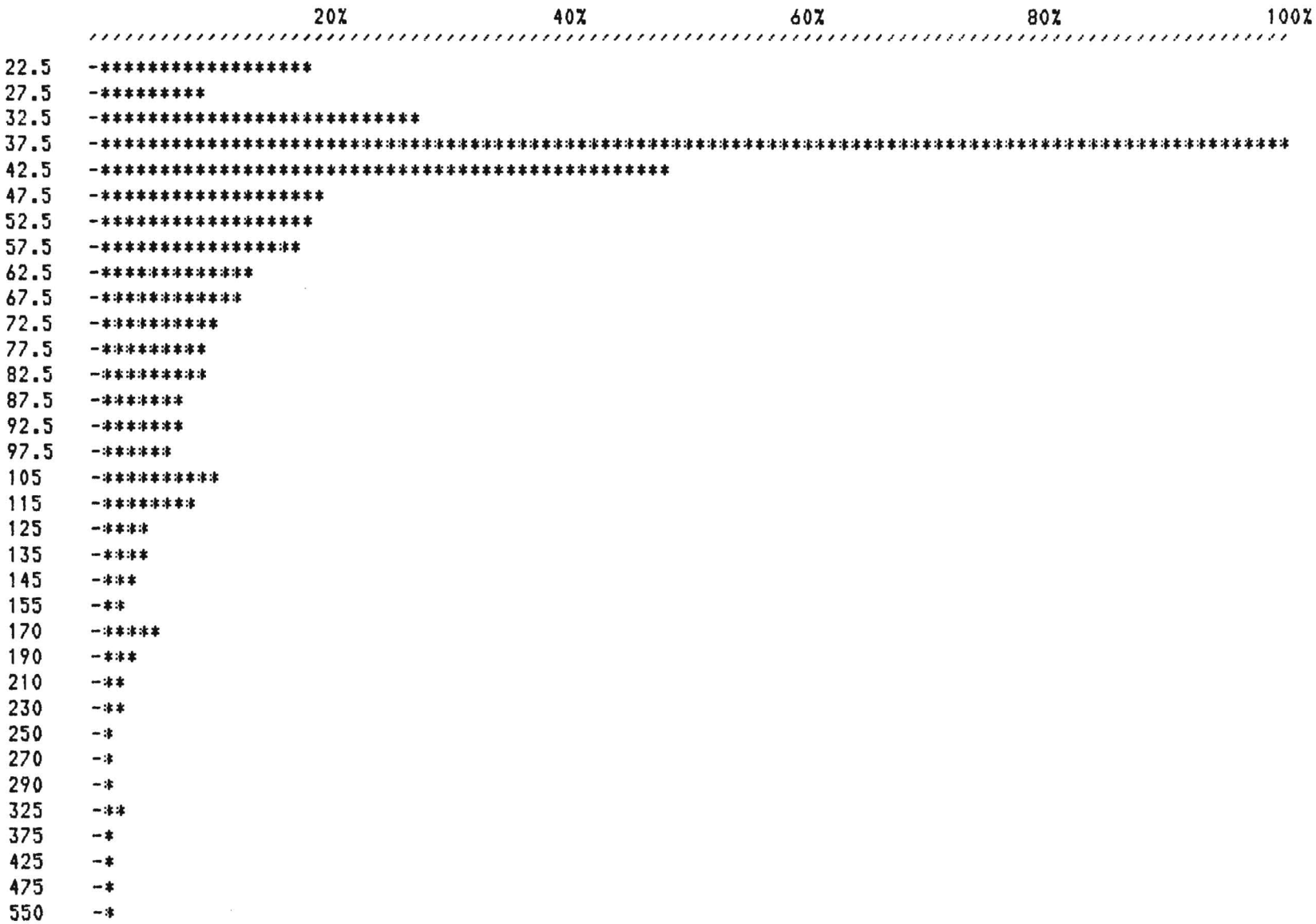
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(8.25492E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(91.0881 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

P/PO	VOL ADSORBED
6.53736E-2	253.867
.108715	270.482
.18283	287.797

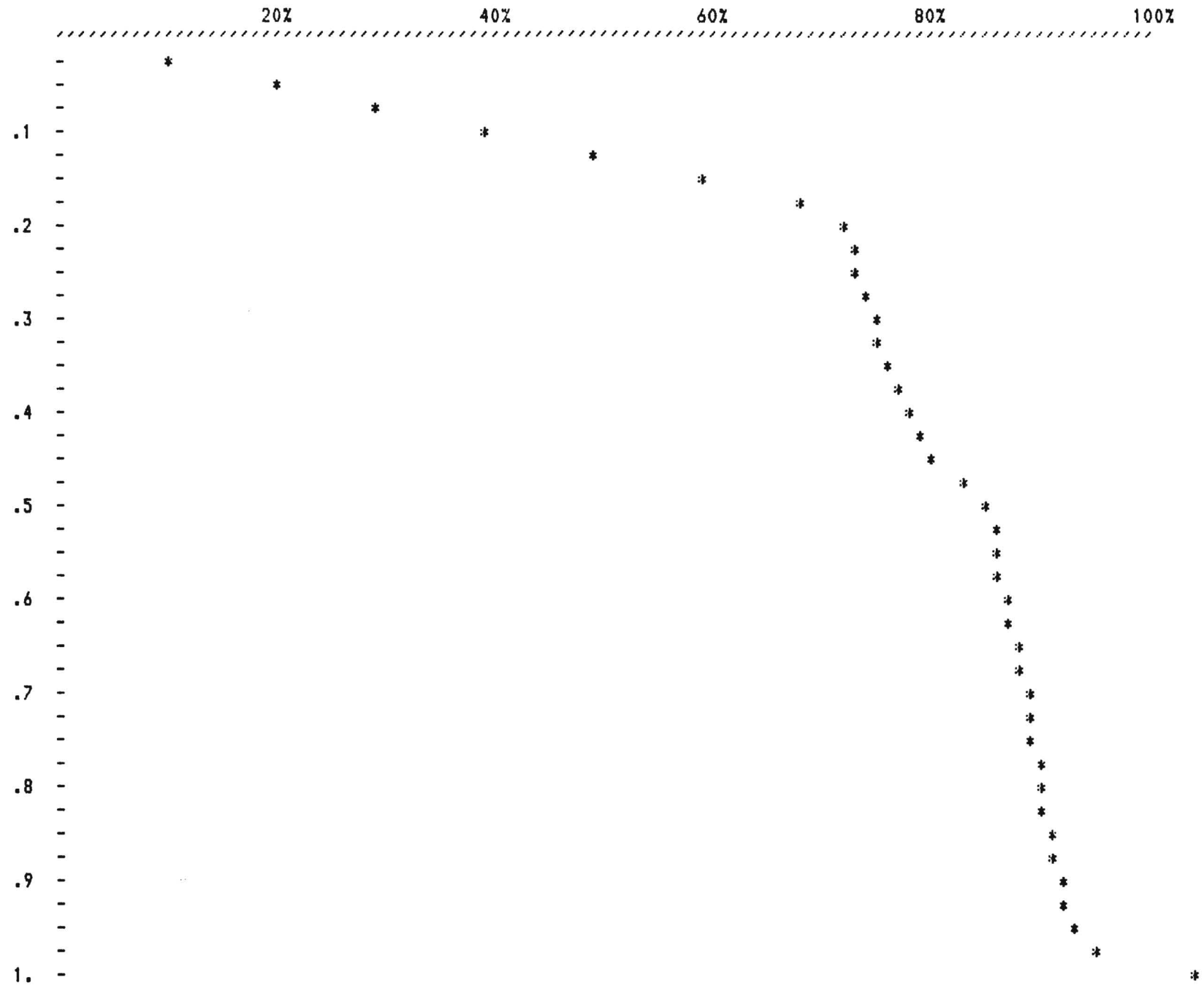
BET AREA= 1017.42 SQ M/G

SLOPE= 4.28715E-3
INTERCEPT=-8.75853E-6
STAND. ERROR= 4.55054E-6

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.988819	406.231
.983955	387.358
.942678	376.183
.880499	371.275
.829099	367.799
.787559	364.257
.733398	361.416
.676346	358.396
.61535	354.094
.561979	350.382
.513326	346.915
.477583	338.412
.458456	325.115
.389376	312.997
.28605	302.801
.230904	295.938
.181805	288.325

DESORPTION ISOTHERM % VOLUME ADSORBED AT .988819
VERSUS RELATIVE PRESSURE

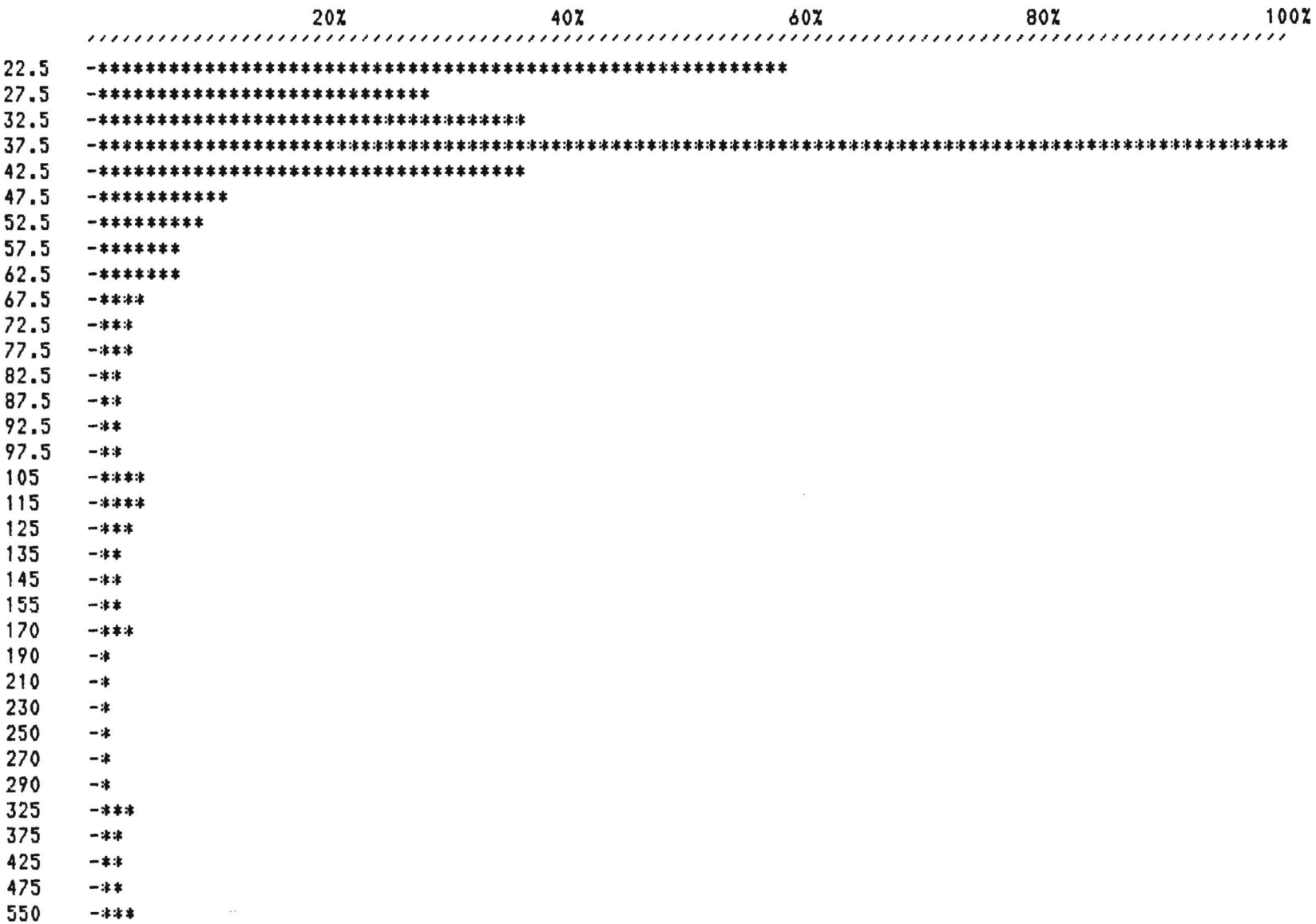


DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	2.21210E-3	.072536	.250077	3.41901
500 - 450	475	1.10605E-3	7.36421E-2	.125038	3.54405
450 - 400	425	1.10605E-3	7.47481E-2	.125038	3.66909
400 - 350	375	1.21352E-3	7.59616E-2	.160876	3.82996
350 - 300	325	2.36097E-3	7.83226E-2	.543529	4.37349
300 - 280	290	9.44389E-4	.079267	.217412	4.59091
280 - 260	270	9.44389E-4	8.02114E-2	.217412	4.80832
260 - 240	250	9.44389E-4	8.11558E-2	.217412	5.02573
240 - 220	230	9.44389E-4	8.21002E-2	.217412	5.24314
220 - 200	210	9.44389E-4	8.30446E-2	.217412	5.46055
200 - 180	190	9.44389E-4	.083989	.217412	5.67796
180 - 160	170	2.11535E-3	8.61043E-2	.661894	6.33986
160 - 150	155	1.31013E-3	8.74144E-2	.426776	6.76663
150 - 140	145	1.31013E-3	8.87246E-2	.426776	7.19341
140 - 130	135	1.31013E-3	9.00347E-2	.426776	7.62018
130 - 120	125	1.86792E-3	9.19026E-2	.681367	8.30155
120 - 110	115	3.20055E-3	9.51032E-2	1.28962	9.59117
110 - 100	105	3.20055E-3	9.83037E-2	1.28962	10.8808
100 - 95	97.5	1.48999E-3	9.97937E-2	.731929	11.6127
95 - 90	92.5	1.47492E-3	.101269	.743836	12.3566
90 - 85	87.5	1.47492E-3	.102744	.743836	13.1004
85 - 80	82.5	1.47492E-3	.104218	.743836	13.8442
80 - 75	77.5	2.30022E-3	.106519	1.3912	15.2354
75 - 70	72.5	2.40939E-3	.108928	1.47683	16.7123
70 - 65	67.5	2.59712E-3	.111525	1.63398	18.3462
65 - 60	62.5	5.15236E-3	.116678	3.77301	22.1192
60 - 55	57.5	5.15236E-3	.12183	3.77301	25.8923
55 - 50	52.5	6.76593E-3	.128596	5.65245	31.5447
50 - 45	47.5	7.98346E-3	.136579	7.19831	38.743
45 - 40	42.5	2.59145E-2	.162494	26.1168	64.8598
40 - 35	37.5	7.26272E-2	.235121	80.1313	144.991
35 - 30	32.5	2.59332E-2	.261054	34.2908	179.282
30 - 25	27.5	2.04079E-2	.281462	32.4434	211.725
25 - 20	22.5	4.18904E-2	.323352	77.207	288.932

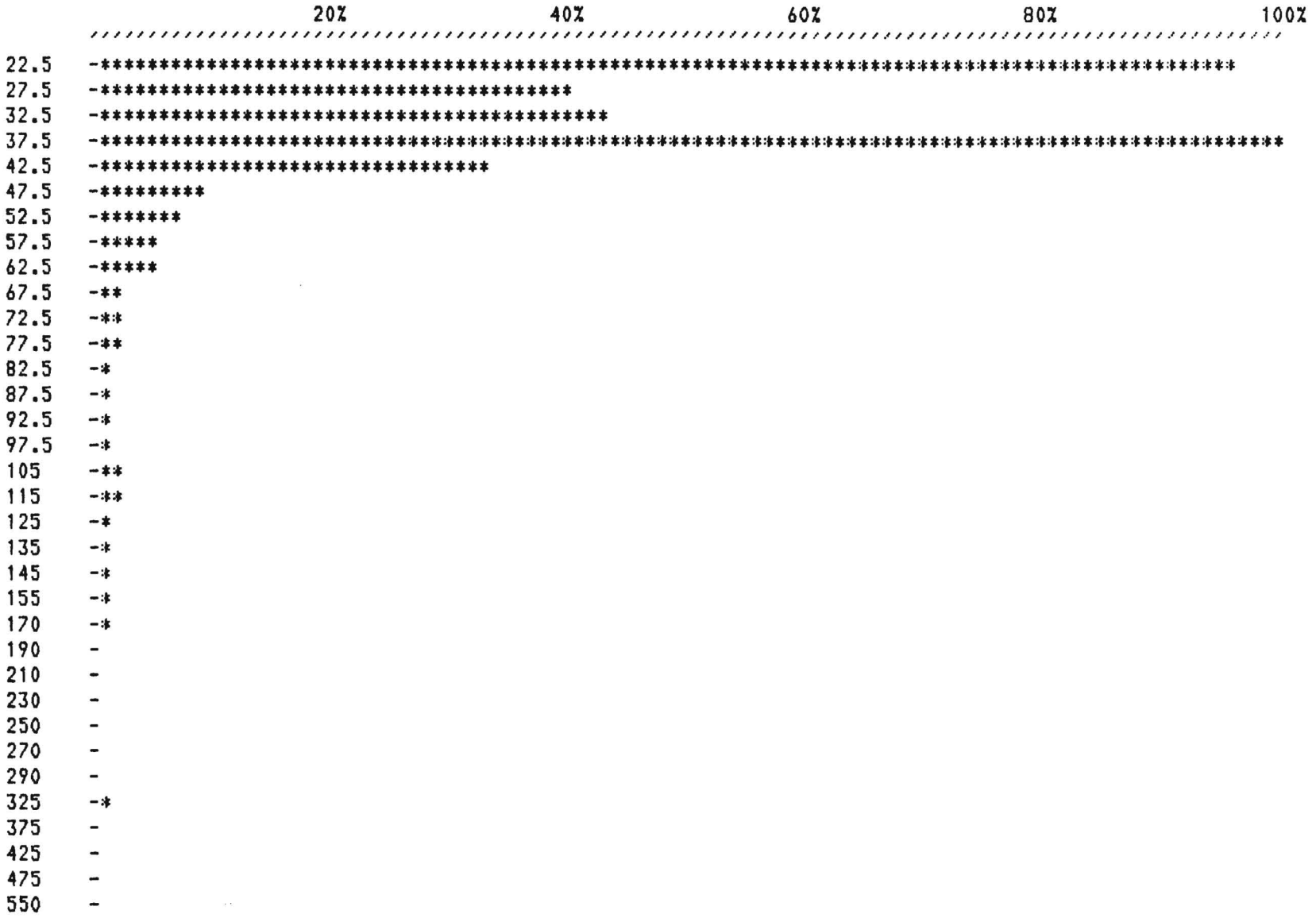
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(7.26272E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(80.1313 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

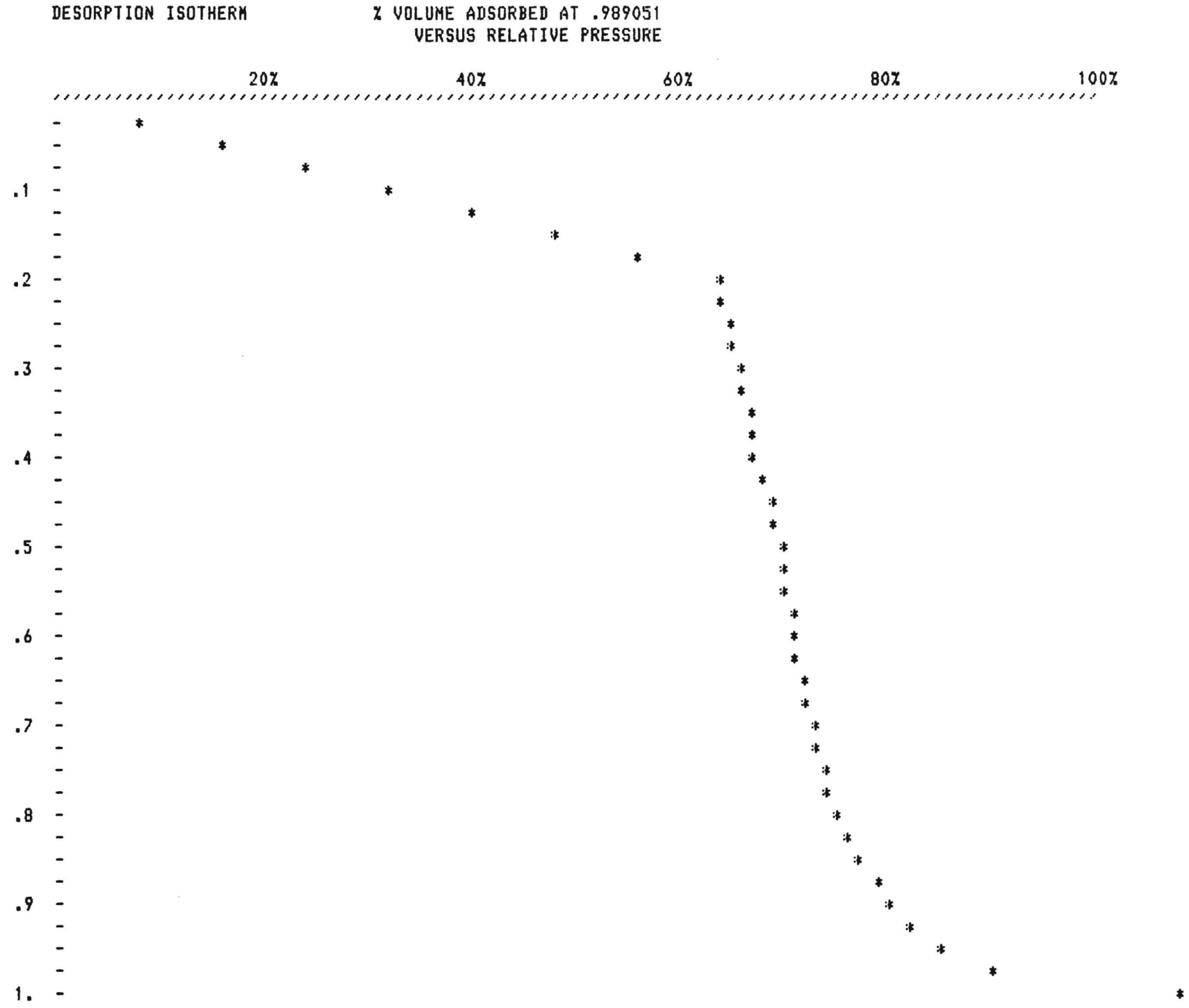
P/PO	VOL ADSORBED
5.77121E-2	151.915
.100186	162.45
.165203	171.326
.224118	176.504

BET AREA= 591.136 SQ M/G

SLOPE= 7.40696E-3
INTERCEPT=-4.32636E-5
STAND. ERROR= 1.98173E-5

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.989051	272.813
.981471	248.796
.961084	234.876
.914298	221.795
.853397	211.083
.786876	203.72
.71931	198.801
.644295	195.601
.564706	192.221
.497283	190.209
.446681	186.656
.389191	183.217
.321625	180.528
.258999	177.408
.199065	173.659


DESORPTION ISOTHERM
% VOLUME ADSORBED AT .989051
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
.1
.2
.3
.4
.5
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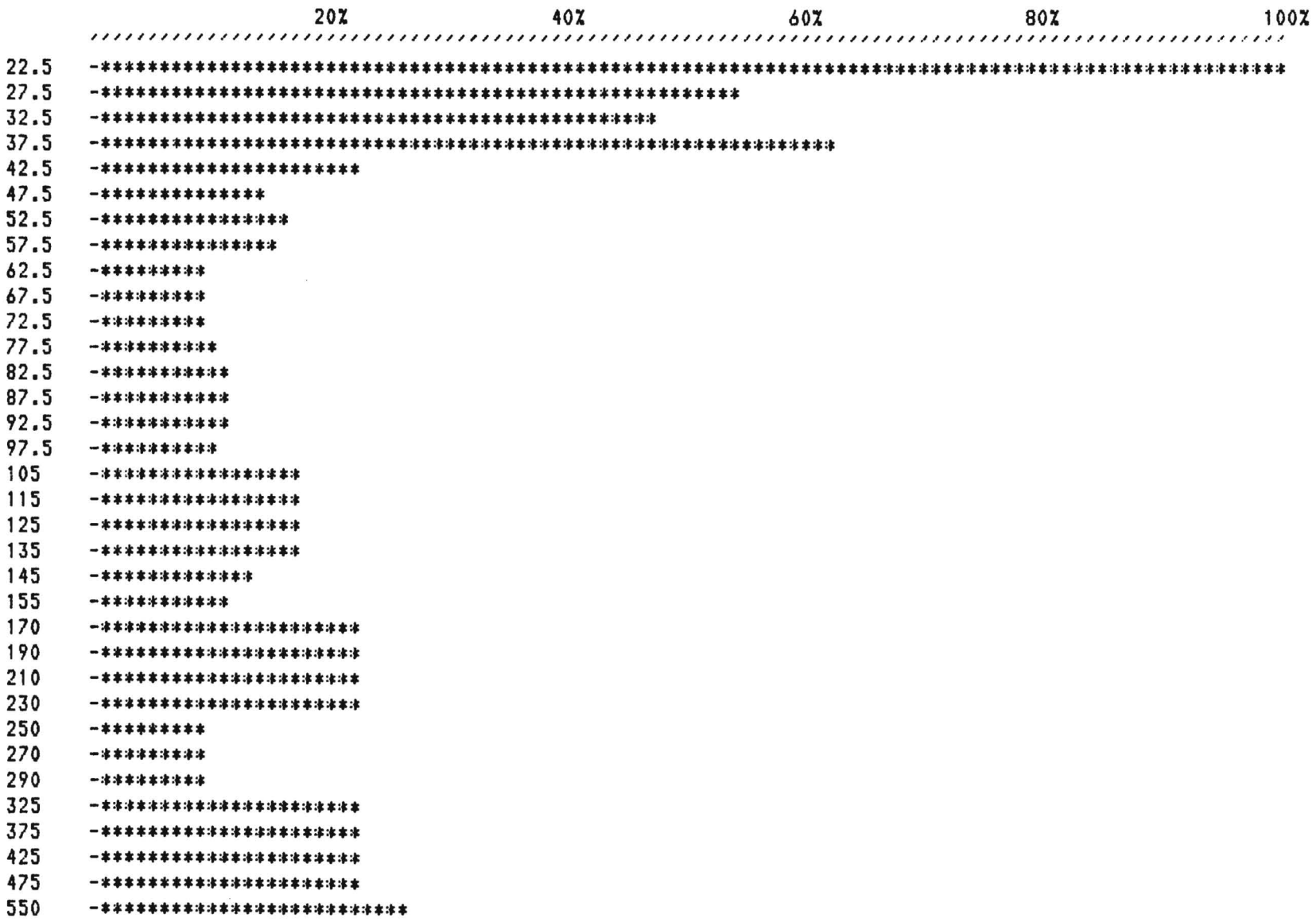
.7
.8
.9
1.

DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	4.99257E-3	.101219	.510832	4.38737
500 - 450	475	4.28543E-3	.105504	.71521	5.10258
450 - 400	425	4.28543E-3	.10979	.71521	5.81779
400 - 350	375	4.28543E-3	.114075	.71521	6.533
350 - 300	325	4.28543E-3	.118361	.71521	7.24821
300 - 280	290	1.71417E-3	.120075	.286084	7.53429
280 - 260	270	1.71417E-3	.121789	.286084	7.82038
260 - 240	250	1.71417E-3	.123503	.286084	8.10646
240 - 220	230	4.27610E-3	.127779	1.19988	9.30635
220 - 200	210	4.27848E-3	.132058	1.20073	10.5071
200 - 180	190	4.27848E-3	.136336	1.20073	11.7078
180 - 160	170	4.27848E-3	.140615	1.20073	12.9085
160 - 150	155	2.13924E-3	.142754	.600367	13.5089
150 - 140	145	2.47119E-3	.145225	.806223	14.3151
140 - 130	135	3.36333E-3	.148588	1.35948	15.6746
130 - 120	125	3.36333E-3	.151952	1.35948	17.0341
120 - 110	115	3.36333E-3	.155315	1.35948	18.3936
110 - 100	105	3.36333E-3	.158678	1.35948	19.7531
100 - 95	97.5	1.98499E-3	.160663	1.01495	20.768
95 - 90	92.5	2.05281E-3	.162716	1.08991	21.8579
90 - 85	87.5	2.05281E-3	.164769	1.08991	22.9478
85 - 80	82.5	2.05281E-3	.166822	1.08991	24.0378
80 - 75	77.5	2.02446E-3	.168846	1.09655	25.1343
75 - 70	72.5	1.72716E-3	.170574	1.16612	26.3004
70 - 65	67.5	1.72716E-3	.172301	1.16612	27.4665
65 - 60	62.5	1.72716E-3	.174028	1.16612	28.6327
60 - 55	57.5	2.87105E-3	.176899	2.35944	30.9921
55 - 50	52.5	3.05083E-3	.17995	2.54698	33.5391
50 - 45	47.5	2.67137E-3	.182621	2.43563	35.9747
45 - 40	42.5	4.27697E-3	.186898	4.44743	40.4221
40 - 35	37.5	1.20261E-2	.198924	13.675	54.0972
35 - 30	32.5	9.16630E-3	.20809	11.8931	65.9903
30 - 25	27.5	1.06112E-2	.218702	16.6105	82.6008
25 - 20	22.5	1.94962E-2	.238198	35.2684	117.869

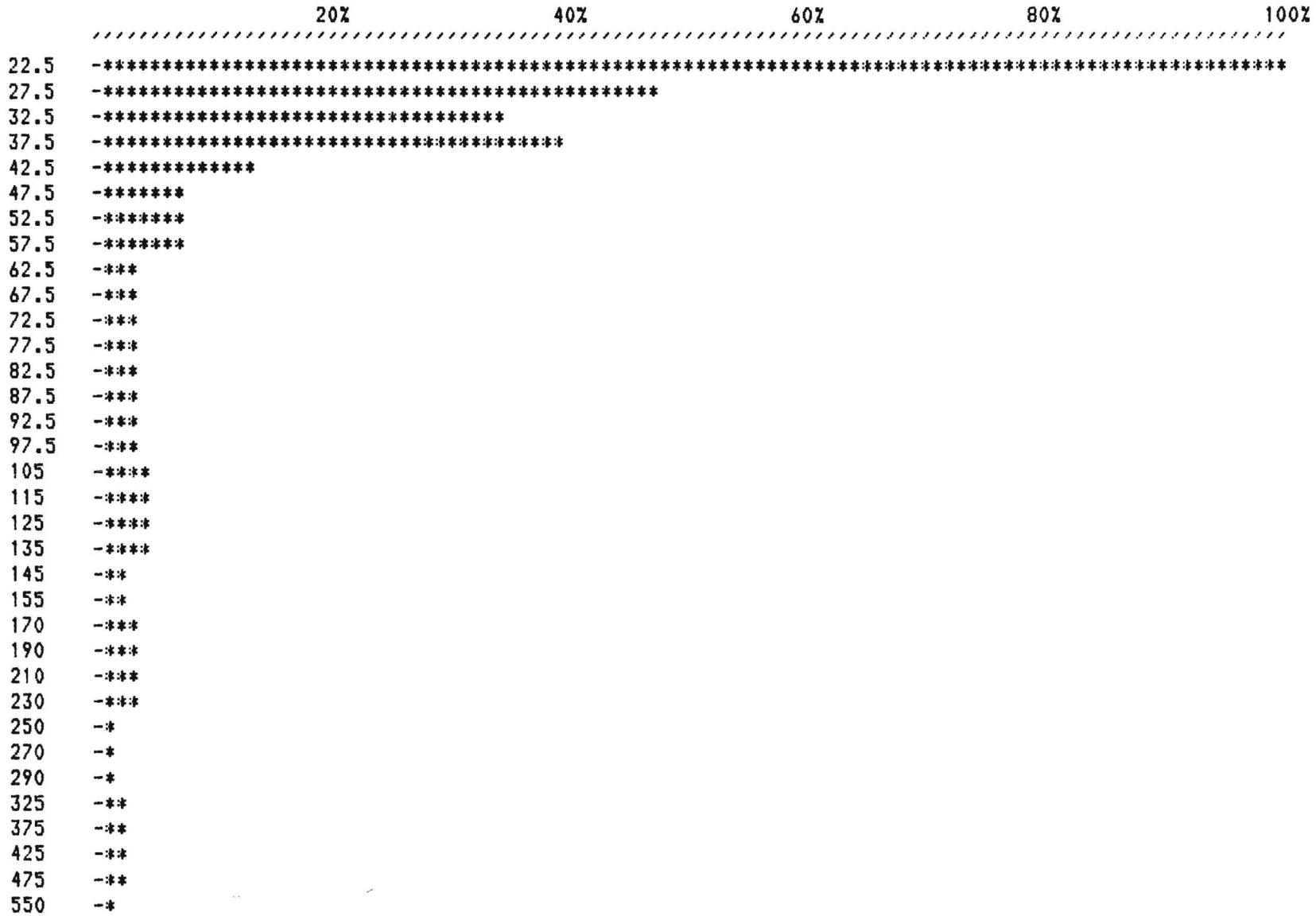
INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(1.94962E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(35.2684 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



ADSORPTION ISOTHERM

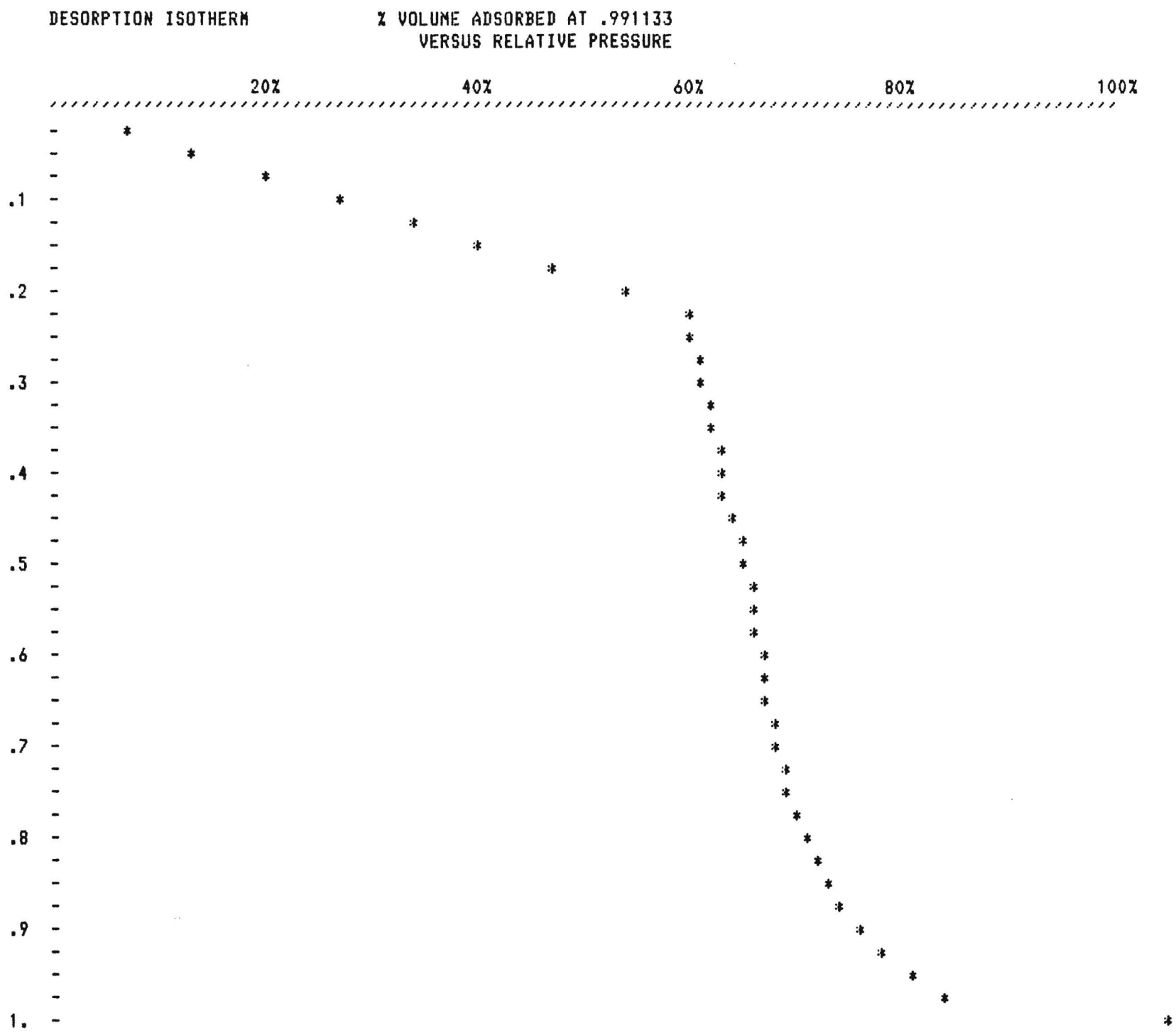
P/PO	VOL ADSORBED
8.88629E-2	190.975
.16241	204.898
.241049	212.766

BET AREA= 682.056 SQ M/G

SLOPE= 6.45875E-3
INTERCEPT=-7.66679E-5
STAND. ERROR= 1.83654E-5

DESORPTION ISOTHERM

P/PO	VOL ADSORBED
.991133	352.104
.989286	336.018
.985724	317.258
.978072	298.595
.937968	278.881
.880714	262.16
.804594	248.738
.711457	240.452
.622542	235.695
.549984	232.09
.481253	228.514
.426901	223.442
.362338	219.313
.295401	215.669
.222368	210.331


DESORPTION ISOTHERM
% VOLUME ADSORBED AT .991133
VERSUS RELATIVE PRESSURE
20%
40%
60%
80%
100%
.1
.2
.3
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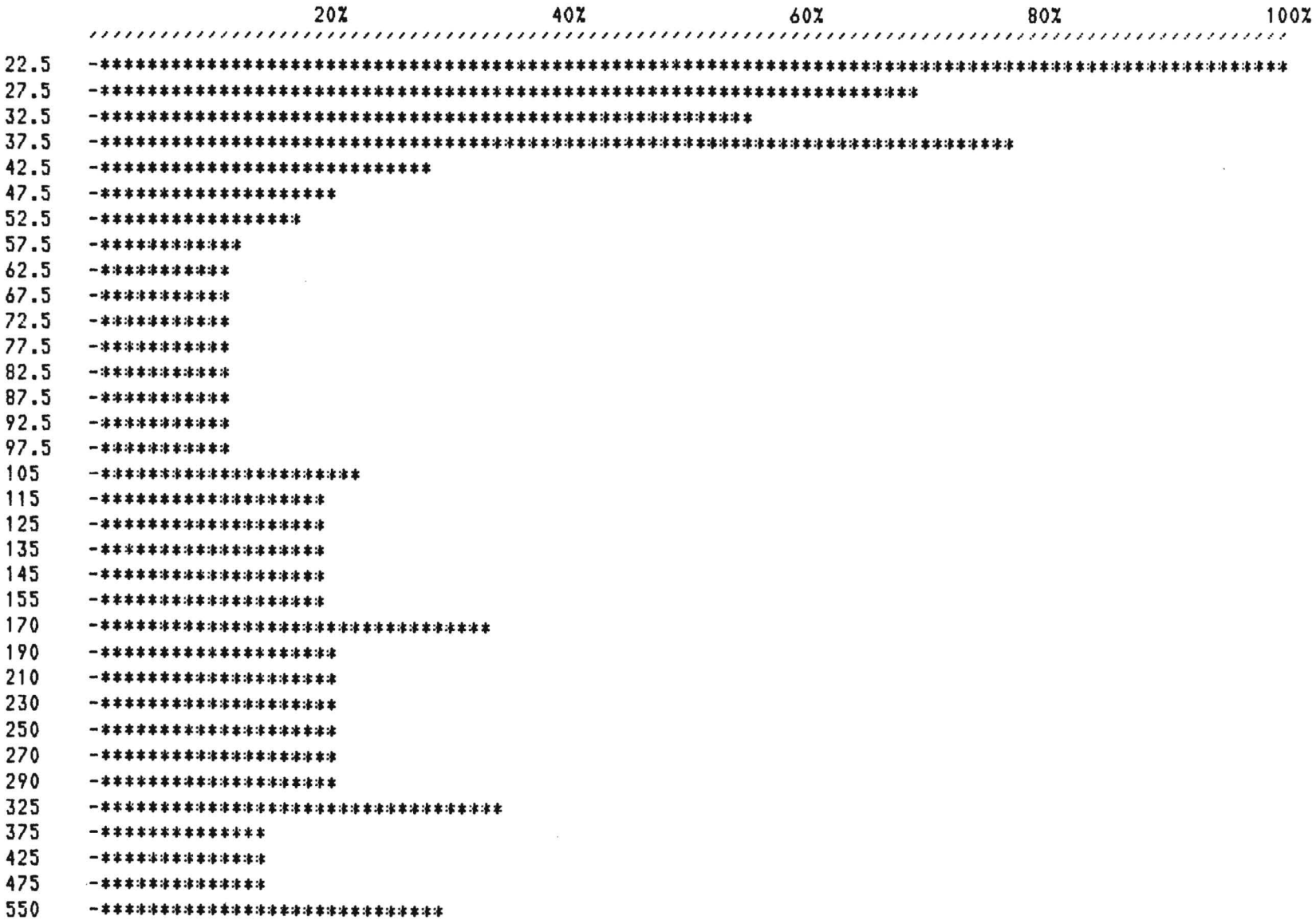
1.

DESORPTION PORE SIZE DISTRIBUTION

RANGE PORE DIAMETER,A	AVERAGE DIA.,A	PORE VOLUME (CC/G)	CUMULATIVE PORE VOLUME	SURFACE AREA (SQ M/G)	CUMULATIVE SURFACE AREA
600 - 500	550	6.01919E-3	.141816	.73461	6.36067
500 - 450	475	3.00960E-3	.144826	.367305	6.72798
450 - 400	425	3.00960E-3	.147836	.367305	7.09528
400 - 350	375	3.00960E-3	.150845	.367305	7.46259
350 - 300	325	7.15624E-3	.158001	1.50299	8.96558
300 - 280	290	4.14786E-3	.162149	.953234	9.91882
280 - 260	270	4.14786E-3	.166297	.953234	10.8721
260 - 240	250	4.14786E-3	.170445	.953234	11.8253
240 - 220	230	4.14786E-3	.174593	.953234	12.7785
220 - 200	210	4.14786E-3	.178741	.953234	13.7318
200 - 180	190	4.14786E-3	.182889	.953234	14.685
180 - 160	170	7.02637E-3	.189915	2.44069	17.1257
160 - 150	155	4.09004E-3	.194005	1.51843	18.6441
150 - 140	145	4.09004E-3	.198095	1.51843	20.1625
140 - 130	135	4.09004E-3	.202185	1.51843	21.681
130 - 120	125	4.09004E-3	.206275	1.51843	23.1994
120 - 110	115	4.09004E-3	.210365	1.51843	24.7178
110 - 100	105	4.55562E-3	.214921	2.33536	27.0532
100 - 95	97.5	2.34036E-3	.217261	1.27742	28.3306
95 - 90	92.5	2.34036E-3	.219601	1.27742	29.608
90 - 85	87.5	2.34036E-3	.221942	1.27742	30.8855
85 - 80	82.5	2.34036E-3	.224282	1.27742	32.1629
80 - 75	77.5	2.34036E-3	.226623	1.27742	33.4403
75 - 70	72.5	2.36513E-3	.228988	1.56743	35.0077
70 - 65	67.5	2.37704E-3	.231365	1.70672	36.7144
65 - 60	62.5	2.37704E-3	.233742	1.70672	38.4212
60 - 55	57.5	2.57959E-3	.236321	1.93677	40.3579
55 - 50	52.5	3.67283E-3	.239994	3.17843	43.5364
50 - 45	47.5	4.22632E-3	.24422	3.8786	47.415
45 - 40	42.5	5.83282E-3	.250053	5.91082	53.3258
40 - 35	37.5	1.60905E-2	.266144	18.3169	71.6427
35 - 30	32.5	1.16487E-2	.277793	15.449	87.0917
30 - 25	27.5	1.45123E-2	.292305	23.5164	110.608
25 - 20	22.5	2.09926E-2	.313297	36.1505	146.759

INCREMENTAL PORE VOLUME DISTRIBUTION

% OF MAXIMUM PORE VOLUME(2.09926E-2 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS



INCREMENTAL SURFACE AREA DISTRIBUTION

% OF MAXIMUM SURFACE AREA(36.1505 CC/G)
VERSUS AVERAGE PORE DIAMETER, ANGSTROMS